FINAL VERSION

INTERNATIONAL CIVIL AVIATION ORGANIZATION
NORTH AMERICAN, CENTRAL AMERICAN AND CARIBBEAN OFFICE

REGIONAL NORTH AMERICAN/CARIBBEAN (NAM/CAR) AIR TRAFFIC MANAGEMENT (ATM) MEETING

SUMMARY OF DISCUSSIONS

SANTO DOMINGO, DOMINICAN REPUBLIC, 19 TO 21 APRIL 2006

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HISTORICAL

ii.1 **Place and Date of the Meeting**

The Regional North American/Caribbean (NAM/CAR) Air Traffic Management (ATM) Meeting,) was held at the V Centenario hotel in Santo Domingo, Dominican Republic, from 19-21 April 2006.

ii.2 **Opening Ceremony**

The Meeting was opened by Mr. Julio César Mejía, representative of the Civil Aviation Authority of Dominican Republic, who welcomed and thanked the presence of the participants, gave an overview of the scope of the Meeting's Agenda and, officially opened the Meeting.

ii.3 **Organization of the Meeting**

The Meeting was chaired by Mr. Julio César Mejía of Dominican Republic. Mr. Vincent Galotti, Chief of the Air Traffic Management Section of ICAO Headquarters and Mr. Víctor Hernández, Regional Officer, Air Traffic Management and Search and Rescue from the ICAO NACC Regional Office acted as Secretaries of the Meeting.

ii.4 **Working Languages**

The working languages of the Meeting were Spanish and English. The Working Papers and Summary of Discussions of the Meeting were available to participants in both languages.

ii.5 **Agenda**

The Meeting adopted the following agenda:

Agenda Item 1: **Second amendment to the *Global Air Navigation Plan for CNS/ATM Systems* (Doc 9750) and ICAO new related initiatives**

Agenda Item 2: **Activities concerning the implementation of an air traffic flow management (ATFM) system.**

Agenda Item 3: **Strategy and regional implementation activities regarding airspace organization and management (AOM), ATS routes, RNAV, RNP, and the 5-letter name codes (5LNC) assignment system**

Agenda Item 4: **Programmes related with the implementation of an Air Traffic Management (ATM) safety management system, Air Traffic Services (ATS), incidents investigation and runway safety (runway incursions) Quality Assurance.**

Agenda Item 5: **New strategies for the implementation of the regional and global air traffic management (ATM) system**

Agenda Item 6: **Other business**

ii.6 **Schedule and Work Mode**

The Meeting agreed to hold its daily sessions from 09:00 to 15:00 hours, with adequate breaks.

ii.7 **Attendance**

The Meeting was attended by 28 participants from 7 States, and observers from COCESNA, IATA and IFATCA, making a total of 34 delegates. The list of participants is shown in pages iii-1 to iii-6.

ii.8 **Recommendations**

The Meeting recorded its activities as Recommendations:

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LIST OF RECOMMENDATIONS

Number	Title	Page
ATM/1	**IMPLEMENTATION OF WORK PROGRAMMES IN SUPPORT OF STRATEGIC PERFORMANCE OBJECTIVES**	1-2
ATM/2	**PROGRESSION OF WORK PROGRAMMES**	1-7
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ATM/4	**ATFM PROPOSAL FOR AMENDMENT IN THE NAM PART OF THE REGIONAL SUPPLEMENTARY PROCEDURES (DOC 7030)**	2-3
ATM/5	**ATFM OPERATIONAL AGREEMENTS**	2-3
ATM/6	**REORGANIZATION OF THE ATM WORK PROGRAMMES IN THE NAM/CAR REGIONS**	3-4
ATM/7	**BEGIN TRIALS ON THE USE OF ICAO ELECTRONIC GLOBAL AIR NAVIGATION PLANNING TOOLS**	3-5
ATM/8	**REGIONAL ATM SAFETY MANAGEMENT SYSTEM**	4-1
ATM/9	**UPDATE OF NAT/NAM/PAC ANP (DOC 8755)**	5-1

ii.9 List of Working and Information Papers

Working Papers

Number	Agenda Item	Title	Date	Presented by
WP/01	---	Agenda and Schedule	05/04/06	Secretariat
WP/02	1	Progress in planning and implementation of the CNS/ATM Systems in the NAM/CAR Regions	28/03/06	Secretariat
WP/03	2	The Fuel Crisis and the Urgent Need to Implement Fuel Saving Measures	05/04/06	IATA
WP/04	3	Implementation of new and proposed RNAV routes	05/04/06	IATA
WP/05	1	Basic Regional and Interregional ATM Planning and Implementation Aspects	07/04/06	Secretariat
WP/06	4	ATM safety management system	07/04/06	Secretariat
WP/07	3	ATM Developments related with airspace Organization and Management	10/04/06	Secretariat
WP/08	3	Review of the ATM Agreements of the Central American States and COCESNA	10/04/06	Rapporteur CA/ANE/WG ATM Cttee
WP/09	2	Air traffic flow management (ATFM) in the NAM/CAR Regions	11/04/06	Secretariat
WP/10	5	Air Navigation Plan - North Atlantic, North American and Pacific Regions (Doc 8755)	12/04/06	Secretariat

Information Papers

Number	Agend a Item	Title	Date	Presented by
IP/01	--	General Information	05/04/06	Secretariat
IP/02	--	List of Working and Information Papers	11/04/06	Secretariat
NI/03	6	Automatización del Sistema de Gestión de Tránsito Aéreo de la República Dominicana (***Available in Spanish only***)	20/04/06	Dominican Republic

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Agenda Item 1: Second amendment to the *Global Air Navigation Plan for CNS/ATM Systems* (Doc 9750) and ICAO new related initiatives.

1.1 The Chief of the Air Traffic Management Section at ICAO Headquarters gave a comprehensive presentation on the Second Amendment to the *Global Air Navigation Plan for CNS/ATM Systems*, which is being renamed as the Global Air Navigation Plan (Global Plan). It was noted that the Global Plan Initiatives (GPIs) contained in the revised Global Plan were developed by the Air Navigation Commission on the basis of an industry developed roadmap which was aimed at bringing near and medium term benefits to aircraft operators, taking advantage of currently available aircraft capabilities and ATC infrastructure and technology. The meeting was informed that in light of budget realities and the new ICAO business planning process, all future work of the Planning and Implementation Regional Groups (PIRGs) would have to be justified and based on clearly established performance objectives in support of the ICAO Strategic Objectives. Furthermore, all terms of reference of PIRGs were being revised in order to ensure that resources were more appropriately directed and that all work, including that of the Secretariat, was in support of the business plan. The methods of reporting PIRG work to the Commission and Council were also being revised to ensure that progress could be measured against timelines and to ensure that performance objectives were being met.

1.2 In the context of the above, the meeting was informed of Conclusion 5/2 of the Fifth Meeting of the All Planning and Implementation Regional Group (ALLPIRG)/Advisory Group (ALLPIRG/5) which took place in Montreal from 23 to 24 March, 2006, as follows:

> That, recognizing that the evolution continues from a systems-based to a performance-based approach to planning and implementation of the air navigation infrastructure, the regional planning groups:
>
> a) note that the Global Plan is a significant component in the development of regional and national plans and that, together with the global ATM operational concept, it provides an effective architecture for achieving a harmonized and seamless Global ATM system;
> b) identify GPIs that most closely align with the well established implementation plans of their respective regions;
> c) select GPIs that would be most effective in achieving the objectives of the region while ensuring continuation of the work already accomplished;
> d) implement GPIs that take into account the Initiatives across regions, to align work programmes and to develop national and regional plans that facilitate achieving a Global ATM system;
> e) utilize the planning tools as the common planning and implementation mechanism, thereby ensuring proper coordination and global integration; and
> f) review, at each PIRG meetings as a part of its regular agenda, the progress achieved and challenges identified in the implementation of GPIs using a common template.

1.3 In follow-up to the above discussions, the Meeting agreed to adopt a performance-based approach to its work and to take steps to ensure that its work was fully supportive of the revised business planning processes of ICAO, the directives of the ICAO Council, and the ALLPIRG Conclusions. The meeting therefore agreed to the following Recommendation:

Recommendation ATM/1 IMPLEMENTATION OF WORK PROGRAMMES IN SUPPORT OF STRATEGIC PERFORMANCE OBJECTIVES

That, in support of the evolution from a systems-based to a performance-based approach to planning and implementation of the air navigation infrastructure, States/Territories/International Organizations of NAM/CAR Regions develop and implement work programmes in support of the following performance objectives

i) Optimization of the ATS route structure
ii) Improve demand and capacity balancing
iii) Enhance civil/military coordination and co-operation
iv) Align upper airspace classification
v) Implement RNP approaches

Performance Objectives

1) Optimize the ATS route structure in both terminal and en-route airspace

Benefits

The benefits of this performance objective are:

- reductions in fuel consumption;
- ability of aircraft to conduct flight more closely to preferred trajectories;
- increase in airspace capacity;
- facilitate utilization of advanced technologies (e.g., FMS based arrivals) and ATC decision support tools (e.g., metering and sequencing), thereby increasing efficiency.

Strategy

En-route airspace

In the near term:
(Target: mid 2008)

- analyze the en-route ATS route structure and implement all identifiable improvements;
- implement all remaining regional requirements (e.g. RNP 10 routes); and
- Finalize implementation of WGS-84.

In the medium term
(**Target : 2011)**

- develop a strategy and work programme to design and implement a trunk route network, connecting major city pairs in the upper airspace and for transit to/from aerodromes, on the basis of PBN and, in particular, RNAV/5, taking into account interregional harmonization;
- monitor implementation progress.

In terminal airspace

- develop a regional strategy and work programme for implementation of optimized standard instrument departures (SIDs), standard instrument arrivals (STARs), instrument flight procedures, holding, approach and associated procedures, on the basis of PBN and, in particular RNAV/1 and 2; and
- monitor implementation progress.

GPIs

The above performance objective is supported by GPI/5: performance-based navigation, GPI/7: dynamic and flexible ATS route management, GPI/8: collaborative airspace design and management, GPI/10: terminal area design and management, GPI/11: RNP and RNAV SIDs and STARs and GPI/12: FMS-based arrival procedures.

2) Improve demand and capacity balancing

Benefits

The benefits of this performance objective are:

- reduction in weather and traffic induced holding leading to reduced fuel consumption;
- improved and smoother traffic flows;
- improved predictability;
- improved management of excess demand of service at ATC sectors and at aerodromes;
- improved operational efficiency;
- enhanced airport capacity
- enhanced airspace capacity; and
- improved safety management.

Strategy (2008)

- identify key stakeholders (ATC service providers and users, military authorities, airport authorities, aircraft operators and relevant International Organizations) for coordination and cooperation;

- identify and analyse traffic flow problems and develop methods for improving efficiencies through e.g.:
    - improved airway structure (unidirectional routes), communications, surveillance, aerodrome capacity and letters of agreement;
- identify on-going regional traffic flow problems and develop methods for improving efficiency on an as needed, graduated basis;
- define elements of common situational awareness;
    - common traffic display, common/weather displays (Internet), communications (teleconferences, web), daily teleconference advisories; and
- develop methods to establish demand/capacity estimates;
- develop a regional strategy and work programme for implementation of ATFM; and
- monitor implementation progress.

GPIs

The above is supported by GPI/6: air traffic flow management.

3) Enhance civil/military coordination and co-operation

Benefits

The benefits of this performance objective are:

- make available military restricted airspace more hours of the day so that aircraft can fly on their preferred trajectories;
- increase airspace capacity;
- allow a more efficient ATS route structure;
- ensure safe and efficient action in the event of unlawful interference; and
- improve search and rescue services.

Strategy
(Target: 2008 and 2012)

- develop guidance material on civil/military coordination and co-operation to be used by States/Territories to develop national policies, procedures and rules;
- establish civil/military coordination bodies;
- arrange for permanent liaison and close cooperation between civil ATS units and appropriate air defense units;
- conduct a regional review of special use airspace;
- develop a regional strategy and work programme for implementation of flexible use of airspace in a phased approach beginning with more dynamic sharing of restricted airspace while working towards full integration of civil and military aviation activities by **2012**; and
- monitor implementation progress

GPIs

The above is supported by GPI/1: flexible use of airspace.

4) Align upper airspace classification

Benefits

The benefits of this performance objective are:

- better utilization of datalink communication;
- optimize use of flight plan data processing systems;
- enhance airspace management coordination, message exchange capabilities and utilization of flexible and dynamic airspace management techniques;
- harmonization of interregional coordination processes;
- improvement of airspace interoperability and seamlessness; and
- ensure the provision of positive air traffic control services to all aircraft operations.

Strategy
(Target: 2008)

Develop a regional implementation strategy and work programme for the implementation of ICAO Annex 11 airspace Class A above FL 195.

GPIs

The above is supported by GPI/4: align upper airspace classification.

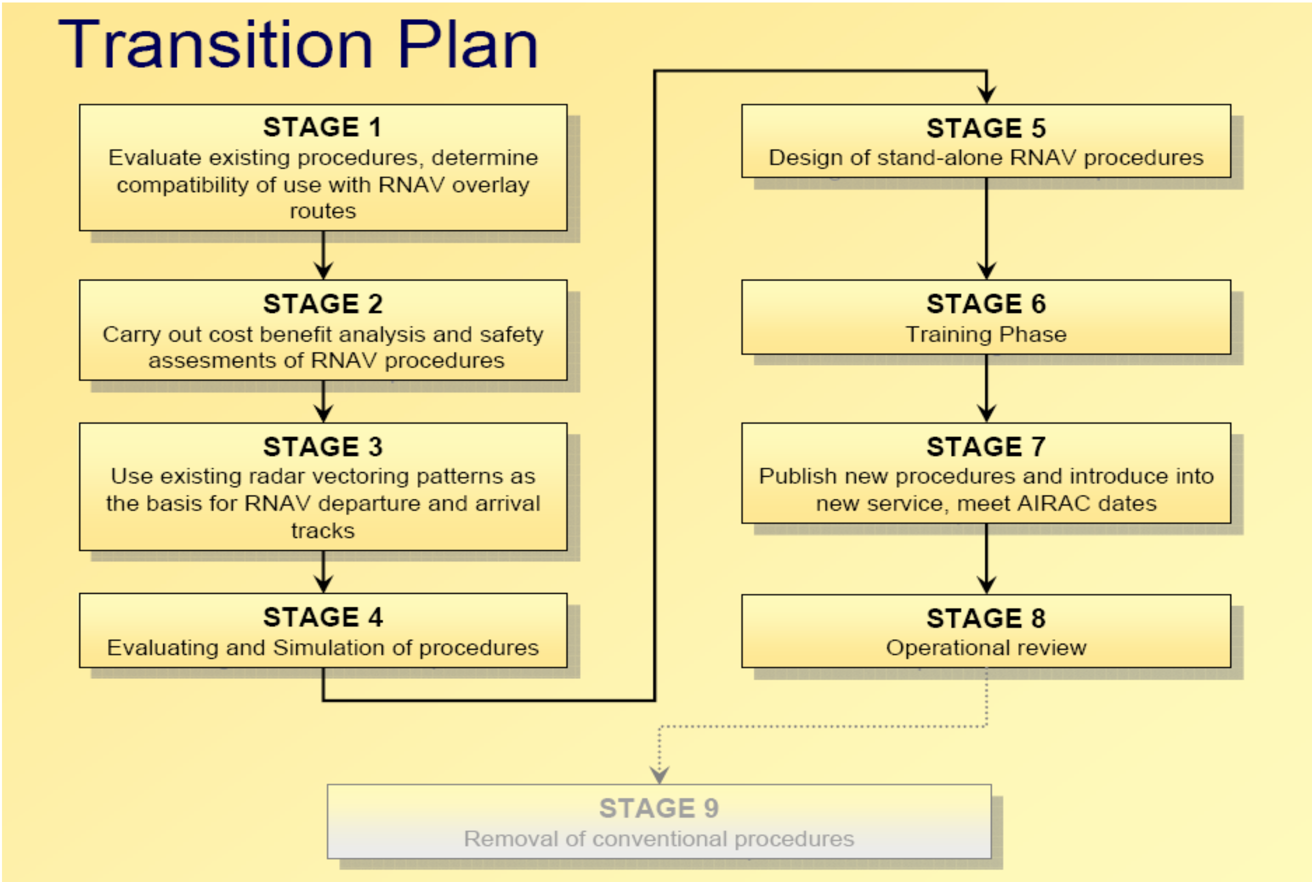
5) Implement RNP approaches

Benefits

The benefits of this performance objective are improvements in capacity, efficiency and safety at aerodromes.

Strategy
(Target: 2012)

- development of a regional strategy and work programme for implementation of RNP approaches at aerodromes where aircraft weighing 5700 kg or more are operated, on the basis of the transition plan below; and
- monitor implementation progress.



GPIs

The above performance objective is supported by GPI/5: performance-based navigation, GPI/7: dynamic and flexible ATS route management, GPI/8: collaborative airspace design and management, GPI/10: terminal area design and management, GPI/11: RNP and RNAV SIDs and STARs and GPI/12: FMS-based arrival procedures.

1.4 The Meeting agreed that the Secretariat would develop draft work programmes for the five areas mentioned above, and would coordinate those with the appointed ATM experts of the NAM and CAR Regions in order to receive feedback. Project charts would then be created and placed on an interactive web site. The respective working papers will be produced for presentation to GREPECAS. Upon endorsement and further refinement, the major areas would serve as the core work programmes for the NAM and CAR Regions. With these actions in mind the Meeting concurred in the next:

Recommendation ATM/2 PROGRESSION OF WORK PROGRAMMES

That, in support of progressing the performance objectives identified under Agenda Item 1, work breakdown structures and appropriate strategies be developed, with the support of the Secretariat, by the following people:

i) Optimization of the ATS route structure (John Jordan, United States)
ii) Improve demand/capacity balancing (Joe Hoff, United States)
iii) Enhance civil/military coordination (Uriel Urbizo, COCESNA)
iv) Align upper airspace classification (Jacques Boursiquot, Haiti, Uriel Urbizo, COCESNA)
v) Implement RNP approaches (Johann Estrada, Dominican Republic).

1.5 The Meeting was given a presentation on ICAO efforts to develop a set of interactive planning tools to support the planning and implementation of the regional work programmes.

1.6 The ICAO Geographic Information Service (GIS) database was presented and was enthusiastically received. The view was expressed that GIS may be able to serve as an interactive ATM planning tool.

1.7 Bearing in mind the information provided by the Secretariat on the Industry Roadmap approved by the NACC/DCA/2 meeting, the Meeting updated the table shown in **Appendix A** to this part of the report on the current status of ATM development in the NAM/CAR Regions.

1.8 Likewise, with the purpose of continuing the coordinated development and implementation of the ATM system in the NAM/CAR Regions, the Meeting agreed to update the information on traffic flows and homogeneous areas presented in **Appendix B** to this part of the report related with the second amendment to the Global Plan through the following:

Recommendation ATM/3 TRAFFIC FLOWS AND HOMOGENEOUS AREAS IN THE NAM/CAR REGIONS

That:

a) ICAO update the table corresponding to the traffic flows in the second amendment to Doc 9750, *Air Navigation Global Plan for the CNS/ATM Systems*, with the information included in Appendix B to this part of the report; and

b) the States/Territories use this information for the effective planning process of the ATM system in the NAM/CAR Regions.

APPENDIX A

STATUS AND DEVELOPMENT GOALS OF THE CNS/ATM SYSTEMS IN THE NAM/CAR REGION REFERRED TO THE ICAO/INDUSTRY ROADMAP

AIR TRAFFIC MANAGEMENT					
No.	**System / Overview Statement**	**Current Status**		**Goal**	**Target Date**
		NAM Region	**CAR Region**		
1	**Revision of ATS route structure / Dynamic and flexible route management.** The establishment of structured but flexible route systems, on the basis of RNAV and RNP capability, aimed at accommodating preferred flight trajectories.	The ATS route structure of NAM Region – Under review. To be included in updated version of the NAM ANP. WP/10, Agenda Item 5.	Phase II a) Implemented Phase II b) Implementation of ATS RNAV route network in CAR/SAM Regions planned by December 2005. The Working Groups have included this task in their work programme for permanent review.	Implementation of ATS route structures on the basis of RNAV and RNP capability that avoid concentrations of aircraft over congested points and, eventually, implementation of a free routing environment that meets the needs of the airspace users to operate along preferred and dynamic flight trajectories.	2013
2	**RVSM / Implement reduced vertical separation** Increase capacity through optimized use of airspace.	RVSM was implemented on 20 Jan. 2005.		Implement RVSM in all airspace. Over the long term, develop and implement new vertical separation minima.	2008
3	**Establishment of Regional airspace safety system performance monitoring structure**	NAARMO was designated for NAM Region Agreement between Mexico, Canada and United States to carry out safety and security coordination meetings.	CARSAMMA (CAR/SAM Monitoring Agency) Implemented December 2002. The quality assurance programmes are evolving towards an ATM safety management system.	To carry out safety assessment for any ATM implementation, as required.	- - -
4	**ACAS II Implementation** Airborne collision avoidance system (ACAS) to detect and avoid on flight conflict situations.	Implemented	Mandatory from 1 Jan,. 2003.	To achieve the goal of using ACAS II, and thus increasing flight safety.	
5	**RNAV/RNP / Capability performance based horizontal navigation.** The implementation of the concept of required navigation performance (RNP) so that horizontal separation can be reduced and benefits achieved by aircraft operators that equip to meet RNP requirements.	United States implemented RNP in domestic and oceanic airspace since 1998. Canada, Mexico and United States agreed on RNP implementation strategy. New RNAV and RNP harmonized implementation should be made in accordance with new ICAO provisions – Planning on going.	Studies ongoing for RNAV/RNP implementation strategy for en-route, terminal and approach procedures. Interregional RNP implementation strategy for the upper airspace *a*greed Studies for interregional RNP implementation strategy in the lower airspace being carried out by other States of the CAR/SAM Regions. New RNAV and RNP harmonized implementation should be made in accordance with new ICAO provisions – (On going).	Incorporate advanced aircraft navigation capabilities as part of the air navigation system infrastructure, bringing additional efficiency benefits to the airspace users.	2011

AIR TRAFFIC MANAGEMENT

No.	System / Overview Statement	Current Status		Goal	Target Date
		NAM Region	CAR Region		
6	**Flexible use of airspace** The optimization and equitable balance in the use of airspace between civil and military users, facilitated through both strategic coordination and dynamic interaction.	Strategic civil.-military coordination meetings for flexible use of airspace and other related improvements are carried out.	Coordination meetings for the flexible use of airspace and enhancements carried out in CAR Region have been scheduled. There are still permanent restrictions of airspace. Improvements are required.	All the States evolve toward complete dynamic integration of civil and military air traffic services including real-time civil/military controller-to-controller co-ordination to the required level through adequate system support, improved operational procedures and enhanced information on civilian traffic position and intentions.	2009
7	**Alignment of upper airspace classifications**. The harmonization of Upper Airspace and associated traffic handling in each State to ensure application of a common ICAO ATS Airspace Class above a globally agreed division level.	Completed	Regional studies on going.	The aim is to achieve a continuum of airspace, free from operational discontinuities, inconsistencies and disparate rules and procedures, so that transition from one segment to another is seamless to both airspace users and ATM providers. Over the long term, the ICAO classification scheme should be simplified to accommodate implementation of the Global ATM Operational Concept.	2010
8	**Enhancement of terminal operations through SIDs/STARs/IFP, etc.** The implementation of optimized standard instrument departures (SIDs), standard instrument arrivals (STARs), instrument flight procedures, holding, approach and associated procedures, taking into account improved aircraft capabilities, along with ATM decision support systems.	Canada and United States have carried out related implementations. Ongoing interregional work between Mexico, Canada and United States.	Some States and Territories have carried out related implementations. CAR/SAM harmonization interregional work ongoing. RNAV/RNP/TF (GREPECAS).	The aim is to optimize TMA capacity and efficiency and provide for more fuel efficient aircraft operations. Aircraft will gradually take on traffic synchronization activities.	2010
9	**Enhancement of traffic and capacity management through ATFM.** The implementation of air traffic flow management (ATFM) measures on a strategic and regional basis, along with reduced vertical separation minimum (RVSM) and RNP, to enhance airspace capacity and improve in operating efficiency.	Interregional implementation between Mexico, Canada and United States of strategic, pre-tactical and tactical measures and improvements to traffic flows and airspace capacity.	Some States have implemented strategic, pretactical and tactical measures to enhance traffic flows, and increase airspace capacity Implementation of FMUs in ACCs is scheduled for 2008. Regional studies ATFM are carried out. ATFM/TF (GREPECAS). Implementation scheduled for 2010. Work for implementation of the development of regional strategies on going.	The overall objective is implementation of the strategic aspects of the global ATM operational concept (i.e., airspace organization and management, demand/capacity balancing, conflict management) including collaborative decision-making techniques, making use of decision support tools. Restrictions would then be largely centred on entry/exit times while tactical separation will revert to the aircraft.	2012

AIR TRAFFIC MANAGEMENT

No.	System / Overview Statement	Current Status: NAM Region	Current Status: CAR Region	Goal	Target Date
10	**Enhancement of aerodrome capacity.** The ATM system should know the position and intent of all vehicles and aircraft operating on the maneuvering area so that capacity can be maintained in all weather conditions. Over the long term, aircraft design should allow enhanced ability to slow and vacate the runway.	Interregional work between Mexico, Canada and United States ongoing. Implemented procedures and improvements to increase aerodrome capacity in a*ll* weather conditions.	Some States have implemented procedures to increase aerodrome capacity in all weather conditions. Implementation of runway safety programmes on-going. There is a Task force on Aerodrome Capacity in the AGA/AOP/SG, which is expecting comments from States having aerodrome capacity problems. Work on regional improvements on going.	The reduction of runway occupancy times through improved runway geometry, lighting, markings and procedures, including the application of reduced runway separation minima, and improvement the ability of aircraft to maneuver on the aerodrome surface in all weather conditions.	2011
11	**Adoption of ICAO flight-level scheme to harmonize level systems.**	Implemented, 20 Jan. 2005.			
12	**Implementation of decision support systems.** **Overview Statement:** Make optimum use of currently available automation functions (e.g., automated FDPS, MSAW, STCA, URET, CTAS, MAESTRO and on-line data interchange systems) in the near and medium terms.	Interregional work between Mexico, Canada and United States ongoing for the inter*face* of ATS Automated Systems.	Several States have implemented advanced ATS automated systems. Regional and interregional interface strategic planning on going for ATS Automated Systems through the Automation TF (GREPECAS).	To implement decision support tools to assist the air traffic controller and pilot with conflict detection and resolution and traffic smoothing, making optimum use of aircraft derived data.	2012
13	**Collaborative Airspace Design** The organization of airspace, in cooperation and coordination with the ATM service provider and airspace users, so that the airspace can be flexibly and dynamically managed to accommodate the preferred trajectories of the users.	Regional improvements on going.	Work on regional improvements on going.	The aim is to standardize airspace organization and management principles applicable on a global basis, leading to a more flexible airspace design to accommodate traffic flows dynamically, initially on a sub-regional basis leading to harmonized management and allocation of airspace and route structures regionally rather than on a national basis.	2012
14	**Harmonize Level Systems** Increase capacity and improve safety through implementation of a globally harmonized and seamless airspace.	Completed		Make a sustained political effort to encourage all States to adopt the ICAO Tables of Cruising Levels based on feet as contained in Appendix 3 to Annex 2 — *Rules of the Air*.	2007

RELATED ISSUES

No.	System / Overview Statement	Current Status		Goal	Target Date
		NAM Region	CAR Region		
1	**WGS-84 Implementation** The geographical coordinates used across various States in the world to determine the position of runways, obstacles, airports, navigation aids and ATS routes are based on a wide variety of local geodetic reference systems. With the introduction of area navigation (RNAV), the problem of having geographical coordinates referenced to local geodetic datums is more evident and has clearly shown the need for a universal geodetic reference system. ICAO, to address this issue, adopted in 1994 the World Geodetic System – 1984 (WGS-84) as a common horizontal geodetic reference system for air navigation with an applicability date of 1 January 1998.	Transition to WGS-84 completed in Canada and United States.	Considerable progress achieved for WGS-84 implementation.	Total implementation of WGS-84 by all States.	2007
2	**Improvement of information exchange through Integrated AIS.** Standardize aeronautical information data exchange format and implement distributed electronic data services. Ultimately, aeronautical information management should provide quality assured information to users in real-time.	Canada and United States are providing QA aeronautical information, but United States need to adopt the ICAO Integrated AI package. The aeronautical information is processed automatically being ready for the future information exchange data model for CDM environment..	Steps to implement an automated Integrated AIS system – In progress. Regionally important steps have been taken in preparation for the data model.	To implement the global data model for the aeronautical information exchange.	2014

RELATED ISSUES

No.	System / Overview Statement	Current Status		Goal	Target Date
		NAM Region	CAR Region		
3	**Enhancement of Meteorological Systems (WAFS, IAVW and Automatic Air-Reporting) to support ATM** To improve the availability of meteorological information in support of a seamless global ATM system.	Migration from T4 charts to WAFS forecasts in GRIB code forms fully implemented by 31 July 2005 and in BUFR code forms) to be fully implemented by 30 November 2006		Enhancement of WAFS in view of producing automated turbulence, icing and thunderstorm forecasts in the grid-point format, and wind and temperature forecasts with improved spatial and temporal resolution to assist ATM in tactical decision-making for aircraft surveillance, air traffic flow management and updating flight plans for flexible/dynamic aircraft routing. Enhancement of the IAVW to improve the forecast accuracy in view of the optimization of the use of airspace and to reduce the time needed for volcanic ash advisories and SIGMET to reach area control centres and aircraft-in-flight. Enhancement of automatic downlink of MET information included in ADS messages to provide accurate upper wind fields and real-time wind profiles to assist in the automatic sequencing of aircraft on approach to maximize runway capacity.	30 Nov. 2006
		A workshop on use of GRIB & BUFR-coded WAFS data was organized by WAFC Provider States, in coordination with ICAO and WMO in 2004.	A workshop on use of GRIB & BUFR-coded WAFS data for Spanish speaking States was organized by WAFC Provider States, in coordination with ICAO and WMO in 2004.		
		Two world area forecast centres (WAFC London and Washington), nine volcanic ash advisory centres (VAAC Anchorage, Buenos Aires, Darwin, London, Montreal, Tokyo, Toulouse, Washington and Wellington) and seven tropical cyclone advisory centres (TCAC Darwin, Honolulu, Miami, La Reunion, Nadi, New Delhi and Tokyo) to serve all ICAO Regions – Fully implemented.			

APPENDIX/APÉNDICE B

Table II-4-1. Homogeneous ATM areas and major traffic flows/routing areas

Areas (AR)	*Homogeneous ATM areas and major traffic flows/routing areas*	*FIRs involved*	*Type of area covered*	*Remarks*
Caribbean/South American (CAR/ SAM) Regions				
ZH 1	Buenos Aires — Santiago de Chile	Ezeiza, Mendoza, Santiago	Continental low density	SAM intra-regional major traffic flow
	Buenos Aires — São Paulo/ Rio de Janeiro	Ezeiza, Montevideo, Curitiba, Brasilia	Continental low density	SAM intra-regional major traffic flow
	Santiago de Chile — São Paulo/Rio de Janeiro	Santiago, Mendoza, Cordoba, Resistencia, Asunción, Curitiba, Brasilia	Continental low density	SAM intra-regional major traffic flow
	São Paulo/Rio de Janeiro Europe	Brasilia, Recife	Continental/oceanic low density	SAM/AFI/EUR inter-regional major traffic flow
ZH 2	São Paulo/Rio de Janeiro Miami	Brasilia, Manaus, Maiquetía, Curaçao, Kingston, Santo Domingo, Port-au-Prince, Ha~~b~~vana, Miami	Continental/oceanic low density	CAR/SAM/NAM inter- and intra-regional major traffic flow
	São Paulo/Rio de Janeiro New York	Brasilia, Belem, Paramaribo, Georgetown, Piarco, Rochambeau, San Juan (New York)	Continental/oceanic low density	CAR/SAM/NAM/NAT inter- and intra-regional major traffic flow
ZH 3	São Paulo/Rio de Janeiro — Lima	Brasilia, Curitiba, La Paz, Lima	Continental low density	SAM intra-regional major traffic flow
	São Paulo/Rio de Janeiro — Los Angeles	Brasilia, Porto Velho, Bogotá, Barranquilla, Panama, Central America, México, Mazatlan (Los Angeles)	Continental low density	CAR/SAM/NAM inter and intra-regional major traffic flow
ZH 4	Santiago — Lima — Miami	Ezeza, Resistencia, Cordoba, La Paz, Porto Velho, Bogotá, Barranquilla, Kingston, Ha~~b~~vana, Miami	Continental/oceanic low density	CAR/SAM/NAM inter and intra-regional major traffic flow
	Buenos Aires — New York	Ezeiza, Resistencia, Asunción, La Paz, Porto Velho, Manaus, Maiquetía, Curaçao, Santo Domingo, Miami (New York)	Continental/oceanic low density	CAR/SAM/NAM/NAT inter and intra-regional major traffic flow
	Buenos Aires — Miami	Ezeza, Resistencia, Cordoba, La Paz, Porto Velho, Bogotá, Barranquilla, Kingston, Ha~~b~~vana, Miami	Continental/oceanic low density	CAR/SAM/NAM intra and inter-regional major traffic flow
ZH 5	North of South America — Europe	Guayaquil, Bogotá, Maiquetía, Piarco (NATEUR)	Continental/oceanic low density	SAM/CAR/NAT/EUR interregional major traffic flow

Areas (AR)	*Homogeneous ATM areas and major traffic flows/routing areas*	*FIRs involved*	*Type of area covered*	*Remarks*
ZH 6	Santiago — Lima — Los Angeles	Santiago, Antofagasta, Lima, Guayaquil, Central America, México, Mazatlan	Oceanic low density	CAR/SAM/NAM intra and interregional major traffic flow
ZH 7	South America — South Africa	Ezeiza, Montevideo, Brasilia, Johannesburg (AFI)	Oceanic low density	SAM/AFI interregional major traffic flow
	Santiago de Chile — Easter Island — Papeete (PAC)	Santiago, Easter, Tahiti	Oceanic low density	SAM/PAC interregional major traffic flow
GM-1	Mexico, Toluca, Guadalajara, Monterrey, Mazatlán, La Paz, Acapulco, Puerto Vallarta, Huatulco, Cancún Gulf of Mexico— North America	Mexico, Houston, Miami; Albuquerque; Los Angeles	Continental/oceanic ~~low~~ high density	CAR/NAM inter-regional major traffic flow
	Cancún, Guatemala, El Salvador, Nicaragua, Honduras, Costa Rica - Miami	Mexico, Central America, Havana, Miami	Continental/oceanic high density	CAR/NAM interregional traffic flow
GM-2	Mexico, Cancun, La Havana, Nassau — Europe	Mexico, Havana, Miami -NAT-EUR	Continental/oceanic high density Major traffic flow	CAR/NAM/NAT/EUR inter-regional traffic flow
GM-3	Costa Rica, Panama, Honduras Kingston, Haiti, Santo Domingo San Juan,The Caribbean — Europe	Central America, Panama, Kingston, Port-au-Prince, Curaçao, Santo Domingo, San Juan – EUR	Oceanic high density	CAR/ EUR intra and interregional major traffic flow
	North America – East Caribbean	New York, Miami, Havana, San Juan, Santo Domingo Piarco	Oceanic high density	West Atlantic Route System CAR/NAM inter-regional traffic flow
North America (NAM) Region				
NA-1	North America / Russian Far East	Toronto, Montreal, Edmonton, Winnipeg, Vancouver, Anchorage, Hong Kong, Russian Far East FIRS, Shanghai, Beijing, Tokyo	Continental High/Low Density	Major traffic flow ASIA/NAM/PAC
NA- 2	North America/ polar tracks	Domestic US FIRs (Chicago, Seattle, Cleveland, New York, Boston, Minneapolis, Salt Lake), Canadian FIRs (Montreal, Toronto, Winnipeg, Edmonton, Vancouver), Anchorage, Arctic, Anchorage Continental, Beijing, Guangzhou, Hong Kong, Pyongyang, Russian Far East FIRs, Shanghai, Shenyang, Taegu, Tokyo, Wuhan, and Ulaanbaatar	Continental/oceanic low density Major traffic flow	One-directional flow ASIA/EUR/NAM/NAT

Areas (AR)	*Homogeneous ATM areas and major traffic flows/routing areas*	*FIRs involved*	*Type of area covered*	*Remarks*
NA-3	Toronto — Cleveland, Chicago	Toronto, Cleveland, Chicago	Continental high density	CAN-US East-west route
	Toronto — New York, Philadelphia, Washington	Toronto, Cleveland, New York, Washington	Continental high density	CAN-US North-south route
	Montreal — New York	Montreal, Boston, New York	Continental high density	CAN-US North-south route
	Anchorage, Vancouver Seattle — San Francisco — Los Angeles	Anchorage, Vancouver, Seattle, Oakland, Los Angeles	Continental high density	CAN-US North-south route
NA-4 Canada East-west flows	Toronto — Winnipeg — Calgary — Regina — Vancouver	Winnipeg, Edmonton, Vancouver	Continental high density	Major traffic flows in Canadian southern domestic airspace
	Toronto — Ottawa — Montreal — Halifax	Toronto, Montreal, Halifax	Continental high density	Major traffic flows in Canadian southern domestic airspace
	Vancouver — Edmonton	Vancouver, Edmonton	Continental high density	Major traffic flows in Canadian southern domestic airspace
	Edmonton — Calgary	Edmonton	Continental high density	Major traffic flows in Canadian southern domestic airspace
	Winnipeg — Regina	Winnipeg	Continental high density	Major traffic flows in Canadian southern domestic airspace
NA-5 US East-west flows	Traffic flows within the US FIRs	Boston, New York, Cleveland, Indianapolis, Chicago, Minneapolis, Salt Lake, Seattle, Oakland, Kansas City, Albuquerque, Los Angeles, Atlanta, Memphis, Fort Worth, Miami, Houston, Dallas,	Continental very high density	Core homogeneous ATM area Major traffic flows in domestic US airspace

Agenda Item 2: Activities concerning the implementation of an air traffic flow management (ATFM) system.

2.1 The Meeting noted that in several NAM/CAR Flight Information Regions air operations saturation periods have occurred, and that in some annual airports traffic increases have reached 13%; it is then foreseen that this problem will continue growing between traffic flows of the NAM Region to/from the Eastern Caribbean and of the Caribbean to/from Europe. It was reported that Canada, Dominican Republic, Mexico, United States, COCESNA and other States have taken the initiative of implementing ATFM service and have developed co-operation agreements for its implementation in the NAM and CAR Regions.

2.2 IATA expressed its concern for the high cost of fuel as well as the fuel savings campaign it has initiated, through which it also requested the Meeting to adopt actions addressed to the achievement of the greatest possible efficiency in the use of fuel, which would undoubtedly help overcome the cost problem. The Fuel Saving Campaign was structured in four parts as follows:

a) Identification of fuel conservation best practices in air transport operations – supported by an assistance program to put these practices into place;
b) Enhancement of the current commercial fuel activities;
c) Identification and remediation of ATM infrastructure deficiencies; and
d) Identification and remediation of ATS effectiveness issues – engaging the ANS providers in a “Save One Minute” campaign.

2.3 The core of the IATA’s proposed programme to States on fuel conservation measures, attached in **Appendix A** to this part of the report, hinges in proposing enhancements to the following areas:

a) continue with improvements in airspace structure and air route design;
b) ATC techniques that take advantage of aircraft navigation capabilities rather than vectoring or assigned speed restrictions;
c) Review of Noise Abatement Procedures and development of implementation guidelines;
d) Closer coordination and cooperation with military authorities to facilitate transit of military restricted airspace;
e) continue with the analysis of opportunities that would allow aircraft to operate closer to user's preferred flight levels; and
f) Discussing fuel conservation with local airlines and seek their assistance in better understanding the corresponding areas.

2.4 The Meeting recalled that many of the proposed actions have been developed in the CAR/SAM Regions and others have been incorporated to the new work programmes discussed under Agenda Item 1 concerning the global plan initiatives (GPI) developed by ICAO in collaboration with the industry; nevertheless, it also recognized that there are still many strategic actions aligned with IATA's proposal that would support the efficiency and improvements to the performance of air operations to attain a better fuel consumption. Some actions that the States/Territories/International Organizations might perform in the short term for fuel efficiency purposes are the following:

- establish a collaborative decision-making (CDM) process
- analyse through electronic processes the ATS routes requirements
- perform an accelerated traffic simulation

2.5 Air traffic flow management (ATFM) is a service addressed to ensure a balance between air traffic with the declared capabilities which helps air traffic control (ATC) to use to the maximum extent its capacity to serve service demand. In order to attain its objectives, the ATFM unit (FMU) monitors air traffic and, if applicable, issues management initiatives to keep a safe, orderly and timely movement of the air traffic flow.

2.6 ATFM implementation will facilitate the path towards a seamless global harmonized and inter-operable air traffic management (ATM) system, merging efforts, data, knowledge, ideas, and concepts, and will contribute with great financial benefits to attain an enhanced safety, an increased ATM system capacity, and effectiveness of air operations. For ATFM implementation, performance objective 2, in line with GPI 6 of the new ICAO Global Air Navigation Plan, should be taken into account, as indicated in Recommendation ATM/1 of Agenda Item 1 of this report.

2.7 Taking into consideration the guidelines of the NACC/DCA/2 and the GREPECAS/13 meetings, it was concluded that the CAR Region is characterized as an homogeneous ATM area with similar operational features and needs, and therefore, as a potential scenario for ATFM implementation.

2.8. COCESNA informed that, in addition to the agreement signed with the FAA, the ATFM project for the Central American FIR has reached a very advanced stage with regard to the studies concerning human resources and training, economic resources investment plan and technology implementation requirements. The Meeting also recalled that COCESNA, in collaboration with the ICAO NACC Regional Office organized an ATFM Seminar for the NAM and CAR Regions held in Tegucigalpa, Honduras, from 27 to 31 March 2006, which main objectives were the review of current and future scenarios related to NAM and CAR Regions, operational agreements, collaborative decision making (CDM) process, traffic forecast, ATS capacity, airport capacity, electronic communication and surveillance requirements, ATFM procedures, training and a possible ATFM proposal for amendment for the NAM Region to Doc 7030.

2.9 It was deemed appropriate that States/Territories/International Organizations take into account the information derived from the ATFM Seminar included in **Appendix B** to this part of the report, as guidelines for the development of their national plans and of an ATFM procedural manual, in order to determine the airport ATS capacity as well as for human resources and training planning. Additionally, it was considered that the States and Territories should review, through a CDM process, the airspace and airports organization and management allowing a better flexibility and optimization of resources for the benefit of ATS users and providers as well as other tasks to develop in the short term such as:

- the harmonization of the States´ aeronautical rules;
- the development of an ATFM operational procedures manual for its common application, including specifications to determine the airport capacity and ATS capacity;
- the improvements regarding surveillance and automated systems for aircraft flight data processing as well as the development and coordination of ATFM messages;
- the effective planning of human resources and required training aspects;
- improvements of traffic forecast;
- improvements of random routes, as well route network programmes; and
- to encourage new operational agreements between ATS users and providers for ATFM implementations, especially in those areas where flow problems are already present caused by the traffic increase.

2.10 Recognizing that ATFM service is currently provided in the NAM Region and that it is necessary to update the information corresponding to Doc 7030, the Meeting deemed appropriate to adopt the following:

Recommendation ATM/4 ATFM PROPOSAL FOR AMENDMENT IN THE NAM PART OF THE REGIONAL SUPPLEMENTARY PROCEDURES (DOC 7030)

That ICAO, in coordination with the concerned States, develop the proposal for amendment corresponding to Doc 7030 with the updated information to provide ATFM service in the NAM Region by **30 June 2006**.

2.11 In accordance with the action plan approved by GREPECAS, it is foreseen that the ATFM service strategic phase be implemented in the CAR Region by 2008. In view that ATFM implementation will facilitate the path towards a seamless global harmonized and inter-operable air traffic management (ATM) system, merging efforts, data, knowledge, ideas, and concepts, and that it will contribute with great financial benefits, an enhanced safety, an increased ATM system capacity, and effectiveness of air operations, the Meeting adopted the following:

Recommendation ATM/5 ATFM OPERATIONAL AGREEMENTS

That the NAM/CAR States/Territories that have not yet done so, encourage ATS providers to establish operational agreements among ATS units for ATFM service provision in the NAM and CAR Regions by **30 November 2007**.

APPENDIX A

REGIONAL FUEL EFFICIENCY ACTIONS: LATIN AMERICA/CARIBBEAN REGION

1. Airspace and air route design. This area alone has multi-million USD per annum potential for fuel savings in Asia Pacific. Some examples include:

   a) New or straighter routes. Routes defined by navigating from navaid to navaid are usually the most inefficient means of navigation. Area navigation (RNAV) and RNP represent greater savings in a fixed route environment. In areas of low-density traffic flexible tracks and user preferred tracks represent the most in fuel savings.
   b) RNAV SIDs and STARs. Routes on climb out and descent are a critical phase of flight in terms of fuel consumption. Consequently SIDs and STARs that are designed based on aircraft operational performance and ATC separation criteria offer significant fuel savings.
   c) Continuous descent profiles for arrivals and approaches offer significant fuel savings, quieter operations, as well as safety benefits. A Continuous Descent Approach can save 450-900 lbs fuel per flight. In terms of regional savings, assuming 4000 approaches were flown daily in Asia Pacific, the annual savings would be approximately 985,500,000 lbs of fuel.
   d) Collaborative Decision Making (CDM). Collaborative Decision Making for route and departure times can significantly reduce ground delays, congestion at bottlenecks and unanticipated reroutes. Allowing CDM for airlines to see the big air traffic picture and self manage slots is a simple program to both the airline and ATS Provider. IATA has identified a desperate need for CDM that is faced by airlines and ATS Authorities during the peak period traffic flows from Asia to Europe and has asked the Bay of Bengal States to urgently consider such a programme. While savings of such a programme is obvious, it is also difficult to measure. However, as example, the first 8 months of operations in 2004 from two airlines alone resulted in 35 reroutes to circumnavigate Afghanistan. Because this was so devastating to their operations, one of these airlines adopted a policy of taking off 4 tons of payload cargo and in its place was adding an additional 3 tons of contingency fuel for every flight that is flight planned to fly over Afghanistan during the midnight rush to Europe– which is about 10 flights per evening for that particular airline.

2. ATC techniques that take advantage of aircraft navigation capabilities rather than vectoring or assigned speed restrictions. Some examples include:

   a) Asking RNAV equipped aircraft to fly parallel offsets to routes in lieu of radar vectors if traffic is a factor on a fix track
   b) Assigning a time based crossing restriction to aircraft as far in advance as possible in lieu of assigning a speed restriction
   c) Allowing an aircraft to fly a visual approach in lieu of executing an instrument approach in VMC conditions
   d) Reduced separation minimums increase the opportunities to save fuel. An example would be applying the 50 nm minimum longitudinal separation rule on RNP-10 oceanic tracks for climbs or cruise climbs.

3. **Review of Noise Abatement and Departure Procedures.**

3.1. Noise abatement procedures were first developed in the late 60's during the era of noisy aircraft engine performance. Since then there has been considerable reduction in noise due to modern engine design. The noise footprint of a modern jet is significantly less than that of the earlier jet aircraft it replaces.

3.2. Noise abatement procedures come at the expense of excess fuel burned. The ICAO Standard for noise abatement is Annex 16, Vol 1, Part V and clearly states that "a*ircraft operating procedures for noise abatement shall not be introduced unless the regulatory authority, based on appropriate studies and consultation, determines that a noise problem exists*". The recommendation that follows states that "a*ircraft operating procedures for noise abatement should be developed in consultation with the operators which use the aerodrome concerned*".

3.3. IATA requests that the State of the airport and the airport authorities that have noise abatement procedures to review the conditions dictating such a procedure and if practical either:

a) Discontinue noise abatement procedures where they are not justified, if for example the climb out occurs over water and there is no community below
b) Allow airlines to choose runways and SIDs that support the direction of flight towards its destination airport,
c) Publish information identifying the noise sensitive areas and allow airlines to choose between the most appropriate of the two ICAO recommended noise abatement departure procedures (NADP). The difference between NADP 1 and NADP 2 could equate to 100-200 kg fuel saving per departure, and
d) Allowing clean airspeed on departures where noise is not an issue, i.e. departures that immediately route the aircraft over water. The rule of thumb for clean airspeed is V2 + 10-20 kts below 3,000 ft and V2 + 100 kts in the continuing climb to 10,000 ft.

4. **Engage in closer coordination and cooperation with military authorities to facilitate transit of military restricted airspace.** In domestic airspace and even near international airports it is difficult to navigate off a fix track without infringing upon military airspace. In addition there are military restricted areas over international waters that prohibit more efficient flight paths. Significant fuel savings could be achieved if ATC were allowed to clear aircraft on more direct routings during the times when military airspace is not being used for military activities.

5. Reviewing opportunities that would allow aircraft to operate closer to preferred flight levels. In particular, unrestricted climbs and descents carry significant fuel savings. Also, providing options to pilots, such as offering a small departure delay or alternate routing as an alternative to a penalising en route altitude provides significant savings, especially to long haul flights that may be stuck for hours at an unfavourable cruising altitude. In the en route environment, RVSM provides greater opportunities to operate at fuel saving altitudes.

6. Discussing fuel conservation with local airlines and seek their assistance in better understanding fuel conversation target areas. Areas that could be explored includes:

a) Programmes that allow minimum use of APU's and maximum use of Ground Support equipment. For example, a B747-400 APU burns 6 times as much fuel per hour as mobile ground support equipment.
b) Allowing departures in direction of flight. Airborne fuel flow is 6 times higher than ground idle, i.e. 18 minutes taxi equals 3 minutes of airborne operation.
c) Allowing visual separation in approach controlled airspace and visual approaches
d) Allowing early arriving flights to slow down to prevent gate holds and ramp congestion
e) Providing opportunities for rolling take offs
f) Allowing cruise climbs or step climbs in oceanic and remote airspace
g) Allowing flexible flight planning so that airlines can flight plan routes and entry/exit points based on the best operational conditions, such as upper wind conditions.

FUEL EFFICIENCY - A BUSINESS IMPERATIVE FOR THE AIR TRANSPORT INDUSTRY

Introduction

The high price of jet fuel is wreaking havoc in the airlines' financial fortunes.

In an industry that typically takes 15 to 20 years before new technologies can translate into system-wide efficiency gains, it is unlikely that switching to an alternative form of energy will be an option in the foreseeable future. Coupled with the lack of control over price, this means that the only hope of winning the battle to reduce energy costs is to achieve even greater operational efficiency.

Fuel efficiency is a pervasive concept touching almost every aspect of the industry from aircraft design and construction through aviation regulatory requirements to airline operation and air navigation service provision. This paper will attempt to explore the current and potential contribution from all of these areas.

The environmental factor as a driver of fuel efficiency is also discussed, as well as the battery of measures that airlines in particular are deploying in their attempt to mitigate the impact of high fuel prices on their operations.

Last but not least, this article will highlight the initiatives and measures taken by IATA in the context of the recently launched industry-wide 'Fuel Action Campaign'.

Aircraft design and fuel efficiency

The trend in fuel efficiency of jet aircraft over time has been one of almost continuous and incremental improvement; fuel burned per seat in today's new aircraft is 70% less than that of early jets. About 40% of the improvement has come from engine efficiency improvements and 30% from airframe efficiency improvements (Figure 1).

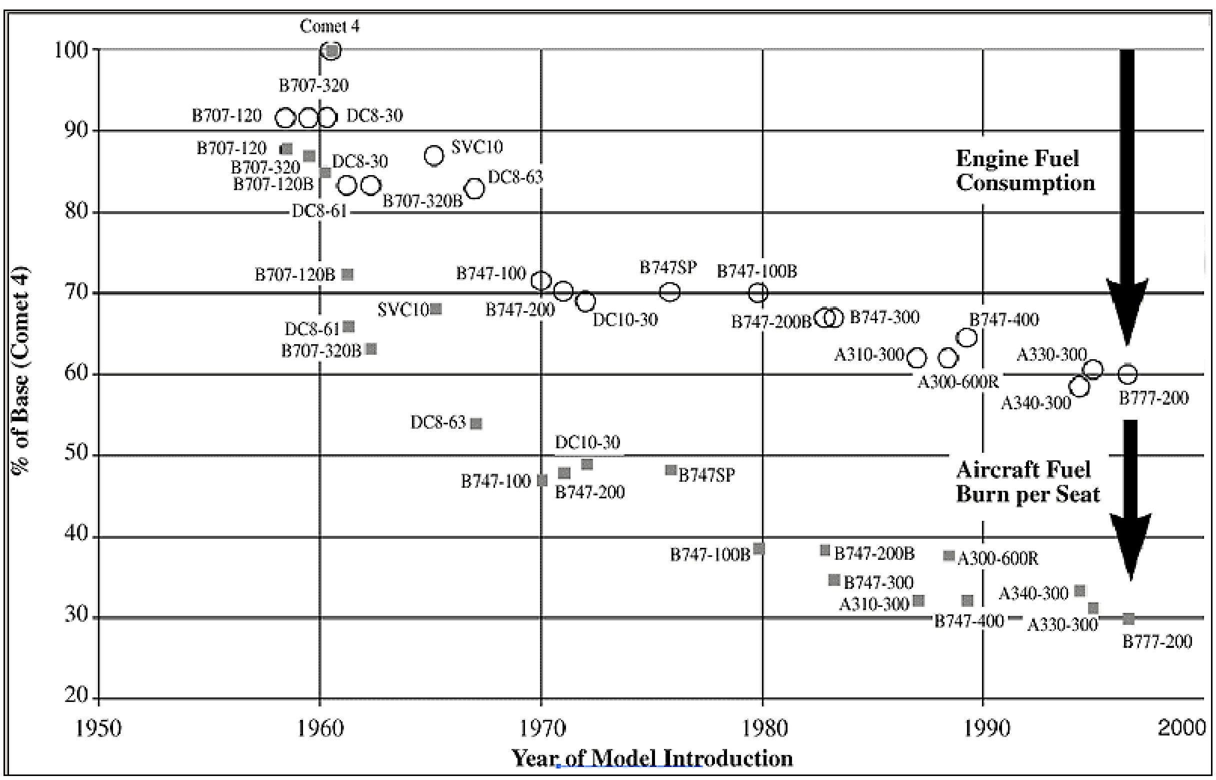
Historically, these improvements have averaged 1–2% per year for new production aircraft (Koff, 1991; Albritton et al., 1996; Condit, 1996). The relatively steady and continuous rate of improvement observed over several decades is likely to continue in the future. In the longer term (2050) compared to 1997, a total aircraft production average fuel-efficiency improvement of 40–50% is considered feasible (ICCAIA, 1997g).

Improvement in engine fuel efficiency has come mainly from the increasing use of modern high-bypass engine technology that relies on increasing engine pressure ratios and higher temperature combustors as a means to increase engine efficiency.

Recent aerodynamic technologies such as supercritical airfoils and winglets have already provided substantial increases in aerodynamic efficiency over first-generation jet transports, and there are many emerging aerodynamics technologies worthy of development and implementation. One of the most promising, especially for improving efficiency in jet transports, is laminar flow control.

The new planes also rely on a greater use of the lighter composite materials rather than conventional aluminium. The A380 is evidence of Airbus' faith in the increasing use of composites. Some 25 per cent of the aircraft is built using composite material – 22 per cent carbon fibre reinforced plastic and three per cent GLARE fibre-metal laminate, which is being used for the first time on a civilian airliner.
Also for the first time the aircraft has a composite centre wing-box, a crucial primary structure that connects the wings to the fuselage. Another first is the composite rear fuselage section behind the rear pressure bulkhead. As well as these composites the A380 has a significant proportion of advanced metallic materials, which also offer advantages such as operational reliability, and ease of repair and maintenance. However, weight saving is one of the greatest advantages of composites, leading to less fuel burn, fewer emissions and lower operating costs.

Figure 1: *Trend in transport aircraft fuel efficiency*

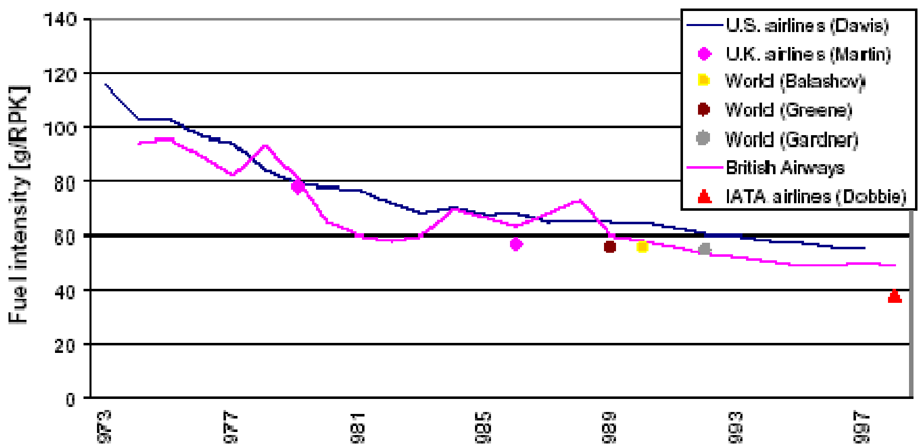


Source: Albritton et. al, 1997

Fuel efficiency on a passenger kilometre basis

The fuel intensity per passenger kilometre of commercial civil air transport has been reduced by approximately 50% since the early 1970s. The use of more fuel-efficient aircraft engines and the introduction of bigger aircraft accommodating more seats per aircraft in combination with an increase in the average stage distances have reduced the fuel use per available seat kilometre (ASK).
The improvement in the specific fuel consumption has furthermore reduced the necessary amount of fuel that has to be carried on flights of comparable distances leading to additional fuel savings. In addition, the operation at higher passenger load factors has contributed to reduce the fuel use per revenue passenger kilometer (RPK).

Figure 2*: Fuel intensity per revenue passenger kilometre (RPK) of passenger air travel*



Sources*:* [Davis 1999], [Martin and shock 1989], [Balashov and Smith 1992], [Greene 1990], [Gardner et. al. 1998], [British Airways 1999a] and [Dobbie 2001].

Competing for fuel efficiency!

More than ever before, fuel efficiency has become a key determinant in an airline's choice of aircraft type. It is interesting to note that Boeing's advertises the B787 Dreamliner as the 'Chief Efficiency Officer'. Scheduled to come in operation in 2008, it will, according to Boeing, "…revolutionise the economics of airplane operations..."

Boeing has emphasized the flexibility and fuel efficiency of the B787, which seats 217 to 289 passengers with a range of up to 8,500 nautical miles. Boeing says the jet will be 20% more fuel-efficient than comparable planes now on the market. The new airplane will provide airlines with unmatched fuel efficiency, resulting in exceptional environmental performance. It will also travel at speeds similar to today's fastest wide bodies, about Mach 0.85.

At the recent inauguration of the Airbus A380, the Airbus officials claimed an advantage in capacity, range and fuel efficiency that drops the cost per passenger 20 percent compared to the 747-400. Airbus says the A380 offers a gain in fuel use of some 15 percent when compared with Boeing's top-of-the-range 747-400. At a cruising speed of 900 kilometers (550 miles) per hour, the A380 delivers a consumption of three litres (5.4 pints) of fuel per passenger per 100 kilometres (62 miles) traveled, according to Airbus. It cites a figure of 3.4 litres (6.2 pints) for the 747-400.

As air traffic recovers to pre 9/11 levels, high fuel costs and fuel efficiency remain key considerations in the airline's choice of new aircraft. It helps that Boeing's B787 is 20 percent more fuel-efficient than older models, while the A380 has the advantage of carrying more people.

Air Traffic Management (ATM)

The urgent need for radical improvement of the air traffic management system to accommodate the continuing growth of aviation and to promote efficient airspace use is recognised by all. The current system and its subsystems suffer from deficiencies in the technical, operational, political, procedural, economic, social, and implementation areas.

Much of the enroute and terminal area air traffic management (ATM) system and airport infrastructure used by the air transport industry today, closely resembles the systems that were used in the 1950's. Expensive, energy guzzling RADAR's for surveillance, zigzag routes based on old very high frequency (VHF) omni-directional radios (VOR's) and Distance Measuring Equipment (DME), and analogue radios slaved to dedicated radio frequencies.

Today's modern air transport aircraft can be tracked using low cost automatic dependent surveillance – contract or broadcast, (ADS-C or B). They can navigate accurately anywhere around the globe with the basic GPS signal and communicate routine messages efficiently using datalink.

Although much has been done to modernize existing Air Traffic Management systems in specific jurisdictions with the resulting benefits of reduced operating costs and handling, the industry is still short of a modern, efficient, harmonized and seamless ATM system.

The all-too fragmented air traffic management system in place today needs complete redesign and a new architecture. Fundamentally, the solution is the ICAO Global Operational Concept aiming at a "Single Sky over a Single Market".

IATA has fully embraced the concept and in concert with a range of industry partners, including the major airframe manufacturers, major avionics manufacturers, and a number of service providers, has developed an ATM Implementation Roadmap.

That Roadmap was delivered to ICAO on the 15th October 2004 to assist the aviation community in its transition from the 'air traffic control environment of the 20th century to the integrated collaborative air traffic management system needed to meet aviation's needs in the 21st century." The ultimate goal is a "One Sky vision of a future integrated global air navigation system, with no inefficiencies resulting form national borders and better use of global airspace resources."

The new concept for air traffic management - with enhanced communications, navigation, and surveillance/air traffic management (CNS/ATM) systems - would benefit the air transportation sector by reducing delays, increasing the capacity of existing infrastructure, and improving operational efficiency.

The implementation of the new CNS/ATM system is underway and is resulting in fuel savings as well as reduced emissions. Several studies conducted on the implementation of the CNS/ATM suggest that improvements in air traffic management could help to improve overall fuel efficiency by 6-12%.

In the mean time various initiatives are underway in the industry to enhance ATM capabilities and efficiency. One such example is the Boeing's air traffic management (ATM) unit, which is an ambitious transatlantic trial of new satellite navigation technology, involving airlines and airports from North America and Europe.

Boeing officials say flight trials have shown that a concept called "tailored arrivals" or continuous descent approaches can improve efficiency and reduce noise and emissions when aircraft land. Under this system, electronic data guide the aircraft on its descent with "the most efficient path to its destination," according to Kevin Brown, Boeing's vice president and general manager of Advanced Air Traffic Management. Also, clearance instructions are transmitted electronically to arriving aircraft so that pilots and air traffic controllers don't require multiple voice transmissions. Such arrivals could save between 400 and 800 pounds of fuel per flight, which adds up to more than $100,000 in annual costs for each aircraft, Boeing officials say.

Early tests of the system -- using an Airbus A330 and a Boeing 747-400 done in Australia showed that tailored arrivals can save airlines fuel, reduce noise and cut controller workload and frequency congestion.

Reduced Vertical Separation Minimum (RVSM)

In a move that is expected to save airlines at least $5 billion in jet fuel costs over the next decade, the Federal Aviation Administration recently doubled the airspace routes between 29,000 feet and 41,000 feet by spacing aircraft a thousand feet apart instead of 2,000 feet. Increasing available high altitude routes gives pilots and air traffic controllers more choices so that aircraft can fly more direct routes at the most fuel-efficient altitudes, saving time and money for airlines and travellers alike.

"When you save fuel, you save money: it’s that simple and more efficient routes save the passenger time," said FAA Administrator Marion C. Blakey. "We’re adding airspace routes, increasing capacity and maintaining the same high level of safety all at the same time." The procedure is called Reduced Vertical Separation Minimum (RVSM) and can add capacity safely because most aircraft are now equipped with advanced, more precise dual altimeter systems and autopilots, FAA said.

The horizontal separation of aircraft in high altitude airspace remains at five-plus miles. RVSM has been implemented safely over the last seven years in less complex airspace from Europe to Australia and over most of the North Atlantic and Pacific Oceans. In Europe the successful implementation of RVSM and associated airspace reorganisation has enabled considerable delay reduction.

Departure Spacing Program

In 2000, the FAA in an effort to improve air traffic departure flow while maintaining a safe and orderly operating environment installed a new flight planning and coordination control tool, called the Departure Spacing Program (DSP). This helps the FAA "deliver uninterrupted, safe service to its clients while reducing communication inefficiencies and increasing air traffic control flexibility."

The DSP enables air traffic controllers to work more efficiently with traffic management coordinators to better use existing capacity for departing aircraft. The system reduces departure-sequencing delays and minimizes terminal-area ground, airspace and telephone congestion.

Regulatory Requirements - Fuel Reserves

Last summer, the FAA relaxed a long-standing requirement that aircraft on international flights carry 10% extra fuel to cover detours because of weather, navigational problems or the need to extend the flight to an alternate airport. Regulators are letting some airlines carry smaller reserves of fuel on international flights to reduce weight and save money.

Russ Chew, the FAA's senior air traffic official, said the FAA, among other things, was working on more efficient air traffic management, improved navigation technology and procedures to permit more direct routing and simpler flight plans. FAA plans to help airlines reduce fuel costs by 1% through 2008. The FAA said because of safety concerns, waivers on fuel requirements for international routes are granted on a case-by-case basis.

So far, American Airlines and Continental Airlines are the only two carriers that have been permitted to carry less fuel, the FAA said. American Airlines claims to reduce its fuel bill by US$10.5 million a year through this new policy on fuel reserve levels.

The potential for savings through reduced fuel reserves is much less for European carriers as they already operate with contingency fuel less than half that of their US counterparts. In any case more airlines should take advantage of the regulatory flexibility that allows them to streamline their fuel reserves by leveraging technological advancement in sophisticated navigation and communications systems, accurate flight planning systems, the ability to update the flight plan through data link en-route, and CAT III B landing capabilities with limits between 200 to 75 meters provided on many aircraft types.

Airports

Airports can also have quite a large impact on fuel and environment effects. Congested airports are the main culprits. Much can be done to reduce the noise and improve local air quality at such airports. One of IATA's service offerings in the consulting area is aircraft flow simulation at airports. Using a simulation model IATA is able to determine delays considering 1) the existing rules and procedures and 2) best practices and facility improvements required to remove limitations. Comparing before and after delays is used to estimate fuel cost savings to justify improvements.

Good apron management techniques on the part of airport authorities can contribute to reduce bottlenecks and contribute to better fuel management. Areas would include effective and coordinated gate allocation, to prevent stand-offs and stop/start taxiing, use of ground power instead of APUs, which are used to run the air-conditioning system of an aircraft parked at the gate. Fuel-powered APUs are eight times more costly to operate than electricity.

There is a need to raise the awareness of the airports authorities to fuel crisis and to encourage them to look for every opportunity to assist airlines in reducing fuel burn.

Fuel Efficiency – the environmental dimension

A 1% saving in fuel for an A320 or B737-300 aircraft will result in a yearly reduction of fuel consumption by**100 metric tons** (32,835 US Gal) and save airlines approximately USD$50,000 per aircraft. It will also decrease the emission of pollutants by the following amounts:

318.7 tons of CO_2;
123.9 tons of H_2O;
2.112 tons of NO_x;
98 kg of SO_2; and
56 kg of CO

Considering there are more than 40 million flights per year (27million scheduled, 13 million freight), the cut in emissions would run in the millions of tons.

A particular challenge for manufacturers and operators lies in the *tradeoffs* that exist between emissions, noise and other design requirements. In many cases, aircraft tend to become less fuel-efficient when design criteria for meeting more stringent noise requirements are considered. Similarly, higher combustion temperatures to improve fuel efficiency typically result in increased levels of nitrogen oxides.

IATA Members plan to achieve an additional 10% fuel efficiency improvement in their total fleet by 2010. This could reduce the total release of carbon dioxide emissions into the atmosphere in this period by almost 350 million tons compared to a scenario in which year 2000 efficiency levels would be "frozen".

Emissions trading

Until now, aviation has been the ‘sacred cow’ of the transport sector excluded from all legislation to minimise environmental impact and damage. But, this is likely to change in the foreseeable future.

There is increased awareness of the aviation’s impact on the environment both in terms of global warming, noise and local air quality. It is estimated that the projected growth in air traffic “may be responsible for up to a quarter of greenhouse emissions by 2030.”

With this increased awareness, airlines face the inevitable prospect of the inclusion of aviation in the EU’s emission trading scheme as of year 2008. Emissions trading involve the government setting carbon dioxide emission limits for individual industries. Emissions trading allow companies to emit in excess of their allocation of allowances by purchasing allowances from the market. Similarly, a company that emits less than its allocation of allowances can sell its surplus allowances.

British Airways has taken the lead in this area and is already a member of the voluntary UK emissions trading scheme currently in place. At this stage, the scheme only covers BA’s domestic operation and UK properties. Nonetheless, BA claims to have achieved an impressive 17% reduction in emissions compared to the scheme 1998-2000 baseline level. But, political consensus on the issue, even within Europe, will be difficult to achieve.

Most airlines prefer emissions trading to environmental taxes as the most effective and efficient instrument to combat greenhouse gas emissions from aviation. ICAO has concluded, " emissions trading is a far more cost-effective mechanism for limiting international aviation emissions relative to taxes and charges. It is committed to continue its study of emissions trading for international aviation.

The cost implications of emissions trading for individual airlines are still unknown. But, as the industry prepares for its implementation in the next three years, it is likely that emissions trading will be a major driver of fuel efficiency for the industry.

No savings is too small for the airlines!

Airlines in response to the high fuel costs are deploying a battery of measures designed to economise on the fuel burn of their fleet. While some of these practices have been in use for years in an unsystematic manner, they are now implemented with renewed urgency across the industry as airlines cope with high fuel costs and cutthroat competition**.** A non-exhaustive list of such measures is provided below:

- Maximise load factors and optimise the position of the centre of gravity when loading aircraft
- Use of flight simulators to replace test and training flights and reduce non-revenue flights wherever possible
- Reduce taxi time an taxiing with fewer engines between the airport gate and the runway
- Use electrically driven ground support equipment as against the use of on-board power generators
- Improve fuel performance of aircraft through maintenance programme and action in the areas of aerodynamic efficiency and engine performance
- Fly slower at cruise altitudes while sacrificing "very little" on its on-time performance
- Carry less weight by pulling heavy ovens and serving trays off of flights where no hot food is served, and by reducing the amount of water and ice they carry
- Retrofit winglets to the end of a wing to improve aerodynamic efficiency.
- Take advantage of price differentials between destinations and 'tankering' fuel
- Swap turboprops for small jets
- Match fuel load closer to actual payload

Better and more sophisticated flight planning through plotting "optimum trajectories"--ways to make routes as direct as possible and shorten approach paths whilst factoring in the effects of wind and weather patterns.

Increase use of onboard flight management systems to calculate optimum fuel use.

Train pilots and dispatchers to learn how to cut back on refuelling to lower the weight of the aircraft, thereby decreasing the amount of fuel burned.

Engine water wash to remove contaminants that build up and can alter the airflow across the turbine blades causing a loss in efficiency

Fly in a straight line as much as possible between certain city pairs results in shorter distances travelled and a reduction in the amount of fuel used

Sensitise ground crews and fuel vendors to prevent aircraft over-fuelling

IATA Fuel Action Campaign

As indicated previously, there are more than 40 million air transport flights per year (27million scheduled, 13 million freight) with annual operating costs for our industry of about USD 375 Billion - of which USD 70 billion is attributable to fuel. An improvement of just 1% in total system efficiency could realise USD$3.75BN in benefits on an annual basis. A reduction in fuel cost - or fuel use – of just 1% would save the airspace users USD$ 700 Million per year.

Market forces drive fuel cost but fuel use or consumption is strongly affected by airline fuel management and air traffic management. Leading the efforts in this area, IATA initiated a Fuel Action Plan in September 2004. The estimated benefit for since launch of Fuel Action Plan is USD 85.3 million [September – December 2004].

Estimated benefits for 2005 from other route improvements are expected to be in excess of USD 700 million. Major achievements include flexible flight planning and transpolar route access in China, new and realigned routes in Middle East, non-ECAC route improvements in Europe and North American random routes off North Atlantic Tracks to West Coast USA.

IATA has stated that these savings should be easily achieved if States and Air Navigation Service Providers (ANSP's) were cognizant of the concerns of their customers, the airspace users. To this end, IATA has initiated a "Save a Minute" Campaign, asking ANSP's to save just one minute through better design and/or management of their airspace. Its sounds simple and - even the ANSP's agree.

This action alone would save airspace users a staggering USD1 billion a year in total operating cost.

IATA has contacted all ANSP's and many have responded positively. IATA is also working with the most senior levels with the International Civil Aviation Organization (ICAO). The ICAO Regional Planning and Implementation Groups (known as PIRGS) have agreed to place the appropriate priority and emphasis on environment and fuel saving. It is important that all stakeholders recognize this issue as THEIR priority and not just the airspace users.

Working closely with Members and industry fuel experts, IATA has developed a best practices fuel guide for airlines and ANSP's entitled "Guidance Material and Best Practices for Fuel & Environmental Management". This material is available on the IATA WEB Site at www.iata.org/fuelaction

The guidance material identifies areas of potential fuel saving and compiles best industry practices in fuel efficiency from an airline and an ANSP perspective. It includes a comprehensive checklist to allow airline management to audit their current fuel management system and ensure that they are taking full advantage of all generally available avenues to reduce fuel expenditure, within the bounds of safety.

Drop by drop, every saving count!

Barring a sudden slump in the world economy, the high price of oil and petroleum products is likely to prevail. There are indications that the various industries dependent on fossil energy are adjusting to the new price levels. Against this backdrop, the pressure for greater fuel efficiency will remain, if not accentuate further, as airlines try to survive in the cut-throat competitive environment of this industry.

The compounded effect of the technological 'push' through technological advancement discussed above and the environmental 'pull' from the coming environmental legislation will contribute to make fuel efficiency a primary goal for the industry.

As the airlines exhaust every single avenue within their control for saving fuel, they need to look beyond and actively engage other stakeholders like the airports and Air Navigation Service Providers where further optimisation can be achieved. It takes a community-wide engagement to reach the next level of fuel efficiency.

APPENDIX B

AIR TRAFFIC FLOW MANAGEMENT (ATFM) REQUIREMENTS

For ATFM, the procedures and the technical and operational agreements will be determined through a collaborative decision making (CDM) process; training allows human resources to acquire the necessary skills for an interoperable system ATFM. States should foster the development of guidelines to establish:

ATFM Specialists

Supervisors

- ACC
- TWR

Air Traffic Controllers

- ACC
- TWR

Users

- Airlines
- Air Taxis
- General Aviation (GA)

Military coordinator

Airport Authorities

Applicable ATFM procedures

ATFM Operational Agreements

Demand capacity balancing (DCB) management

The purpose of DCB management *is to establish sufficient capacity to provide service to normal and peak time traffic levels; to increase capacity, the responsible ATS authority shall ensure that agreed safety levels are not jeopardized.*
When all the agreed requirements are adequately covered, the service capacity is 100%; the latter reduces when said requirements are restricted in their operation; the more restriction the less service capacity. A record of all the aspects concerning the declared capacity should be carried out, in order to be able to determine when it is reduced or needs to be increased. Among the most important DCB management aspects are the following:

ATS capacity. In order to attain its maximum efficiency, the following aspects should be analysed.

- Airspace and route structure - the operation of all the types of aircraft foreseen with the user's preferred profiles should be allowed; the final objective is to attain a dynamic and flexible use of airspace.
- High and low sector, TMAs, restrictions, etc.
- Available infrastructure and navigation accuracy of the aircraft using the airspace and routes in regard with agreed regional air navigation requirements
- ATC workload
- Weather aspects

Airport capacity - The development and establishment of a master plan aimed at optimizing the available airport capacity should be fostered; and the future service requirements should also be studied with regard to the following aspects:

- Runway and taxiway
- Airport capacity (timing use of runway, taxiways, and ramp) delays, restrictions, SLOTS, etc.
- Airport acceptance rate: considering additional services such as ramp, immigration, custom, and others related for:
    - VFR operations
    - IFR operations

Communication systems

- Teleconferences
- ATFM related messages

ATFM situational awareness elements

- Flight Monitoring
- Sector capacity alerts
- Airport capacity alerts
- Evaluation of traffic flow forecasts by areas
- Traffic forecasts (PROSAT)
- Weather forecasts

CDM process

Contingency Planning

Additional training factors

- To develop programmes to share experiences on lessons learned on ATFM operational procedures
- Use of Internet, CD and DVD
- ATFM resources available in web pages

PLANNING REQUIREMENTS OF ATM HUMAN RESOURCES AND TRAINING

In accordance with NACC/DCA meetings directives and upon specific operational requirements, when possible, the following guidelines for human resources planning should be considered:

ATM SPECIALITIES

- Air Traffic Controller - TWR
- Air Traffic Controller - APP
- Air Traffic Controller - Area
- Air Traffic Controller – Radar/APP
- Air Traffic Controller Radar/Area
- ATC Operational Supervisor
- ATFM coordinator
- ATC/OJT Instructor
- ATS airspace planning Officer
- ATS regulations Officer
- ATS Quality Assurance Officer
- ATM Safety Officer
- ATM internal auditor Officer
- Search and Rescue (SAR) Officer for RCC or RSC

Basic criteria to assess ATC workload:

- Average operations volume
- Short and medium terms (2010/2015)
- Personnel increments and decrements, upon operational justification
- Average percentage of last 6 months
- Increase one ATCO when the total rate number is higher than 50%
- Determining required personnel to cover week days off, vacation periods and others
- Justify changes for other factors
- Adequately cover positions in accordance with ATS unit purposes
- Traffic volume, specially peak time periods during the shift
- Avoid affecting the service
- Equitable distribution of workload
- ATCOS available during their journey
- Average operations that ATC personnel (ACC) may handle in one shift (8 Hrs)

E.g. RADAR duties:

Tc	=	COMMUNICATION TRANSFER	30”
COM	=	COMMUNICATION (INSTRUCTIONS)	75”
C	=	SEPARATION	45”
			150”

$$C = \frac{3600}{TC+COM+S} = \frac{3600}{150} = 24 \text{ OPS/h}$$

24 OPS X 8 = 192

Average of operations that ATC personnel (ACC) may handle in one shift (8 Hrs)

<u>NON RADAR duties</u>

COR	=	COORDINATION
CO	=	COMMUNICATION
S	=	SEPARATION
TCO	=	COMMUNICATION TRANSFER

$$C = \frac{3600}{COR+CO+S+TCO} = \frac{3600}{240} = 15 \text{ OPS/h} : 105$$

- -

COLLABORATIVE DECISION MAKING (CDM) PROCESS

The purpose of Collaborative decision-making is satisfy the convened levels of capacity and efficient use of resources, and allows that all members of the ATM community, especially airspace users, to participate in ATM decision-making that affects them. The level of participation reflects the level to which the decision will affect them.

Collaborative decision-making applies to all layers of decisions, from longer-term planning activities through to real-time operations. It applies across all concept components of the ATM system and is an essential element to achieving an acceptable solution, which takes into account the needs of those involved. ; the rules for determining priorities for access to an ATM resource will have been collaboratively agreed in advance, applied both actively and, through agreed procedures, passively.

Effective information management and sharing will enable members of the ATM community to each be aware, in a timely manner, of the needs, constraints and priorities of other members in relation to a decision-making issue. Collaborative decision making can occur between airspace users directly, without any involvement of an ATM service provider. Any member of the ATM community can propose a solution

Where a service provider is involved in collaborative decision making because of a requirement of the ATM system, it is often the ATM service provider who will propose a solution for consideration of the airspace user, as the service provider is aware of the requirements of other users and service providers and the collaboratively agreed rules for resolving competing requests for an ATM resource. However, because it is an information rich environment where the airspace user may have access to the same information as the service provider, the airspace user will understand why the particular solution is proposed.

A user can propose an alternative solution that addresses a user’s preference that is not known to the service provider. In the same way the service provider can reject the user’s proposed solution because of an ATM requirement that the user is not aware of.

Information management

Information management aims at integrating the ATM network in the information sense, not just in the system sense, forms the basis for the migration from past one-to-one message exchange concept to the future many-to-many information distribution , to geographically dispersed sources which collaboratively updating the information, with many geographically dispersed destinations.

Information managing the quality, integrity and accessibility of this complex, growing web of distributed will ensure that the information needs of ATM stakeholders, both within as well as outside the ATM network, will be satisfied in a much more flexible and cost-effective manner than previously.

Decision-making is a normal operational process, but decisions will be of a better quality and engender greater confidence because accurate and validated information in the right form, in the right place and at the right time. An open systems environment and better information management will allow information sharing on a much wider basis than hitherto, and will support a permanent dialogue between the various partners, throughout all phases of flight.

Automated systems are big support for CDM and ATM en-route services. The aim of these systems are conformance and safety monitoring.

Phases of flight

Trough CDM in the departure and landing phase of flight, ATM service delivery management might ensur that flights can get to the runway in time for their take-off slot and at the same time to integrate them with all the other departing and arriving flights in order to ensure safety and to optimize the use of the parking locations, ramps, taxiways and runways. The ATM service delivery management will ensure that service providers are given access to real-time data on projected arrivals and departures, runway loading, airport congestion, parking locations and environmental considerations, in order to reduce the inefficiencies in aircraft and vehicle movements.Within the en-route phase of flight, ATM service delivery management will be involved in matching ATM service capabilities with demand — e.g. traffic flow characteristics — by a range of means, including, inter alia, dynamic re-sectorization in ATM service centres, changes to route structures or airspace organization, or changes to conflict management modes.

During the course of a flight — from its inception at a scheduling or planning stage, through its actual operation, to its completion at an arrival parking location
a) planning — integration into the ATM environment to achieve a close match between user preferred trajectory and system delivered trajectory;

b) ramp —moving of the aircraft in and out of the parking locations;

c) surface-departures — moving aircraft from ramp to departure queue;

d) departure —the departure queue and the runway are managed to launch aircraft from the queue into the airspace;

e) dispersion — where aircraft get up and out of the terminal into the en-route structure;

f) cruise — in which the aircraft is at altitude and moving towards its destination, but it is not yet subject to actions related to its arrival phase;

g) collection — the state in which aircraft are sequenced and spaced to bring them into the terminal area for arrival;

h) approach — in which aircraft are assigned to runways and onto the surface;

i) surface-arrival — moving aircraft off runways and to the ramp; and, once again

j) ramp — working the aircraft into the parking location.

Agenda Item 3: Strategy and regional implementation activities regarding airspace organization and management (AOM), ATS routes, RNAV, RNP, and the 5-letter name codes (5LNC) assignment system.

3.1 The Meeting reviewed progress reports on ATM work accomplished in joint efforts regarding airspace organization and management (AOM), RNAV routes, RNP, RVSM, contingency planning, English proficiency, letters of agreement (LOAs), and ATM automation in NAM and CAR Regions. COCESNA presented the status of SAR agreements, Quality Assurance Programmes held in Central America, included in **Appendix** to this part of the report.

Airspace organization and management (AOM)

3.2 The Meeting recalled that the States/Territories/International Organizations have achieved great progress in implementing ATM in the FIRs of the NAM and CAR Regions; notwithstanding, in spite of the efforts attained there are still some inconsistencies to be solved regarding the airspace organization and strategic management, such as:

- rigid airspace divisions and route structures which do not allow the totality of ATM resources to be used to best effects;
- discontinuities and differences in classification and transition altitudes between adjacent airspaces;
- requirements to fly departure and arrival procedures;
- lack of civil military coordination for flexible and optimum use of airspace;
- exclusion of civil air traffic from airspace reserved for defense purposes;
- operation of aircraft at inefficient altitudes, speeds, and in unfavorable winds;
- less than optimum use of scarce resources such as airspace and aerodrome capacity;
- limited collaborative decision making between Civil Aviation authorities, ATM providers, aerodrome operating authorities and aircraft operators;
- limited facilities for real-time information exchange between ATM providers, aerodromes and aircraft operators; and,
- insufficient flexibility to permit optimum management of weather related disruptions to airline operations.

3.3 When analyzing latest aspects, the Meeting noted that the totality of airspace should be considered as an available resource for users, establishing a dynamic and flexible management wherein any restriction be considered only on a temporary basis. In order to achieve this, one of the objectives of the ATM system is to encourage the flexible use of the global airspace through the optimization and equitable balance in the use of airspace between civil and military users, facilitated through strategic coordination and dynamic interaction of civil and military air traffic services including real-time civil/military controller-to-controller co-ordination.

3.4 To the extent possible airspace should be structured free from operational discontinuities, inconsistencies and differing rules and procedures. In other hand, alignment of airspace classifications can facilitate the implementation of ATFM service, introduction and better utilization of data link communications, an improved flight plan processing system, and advanced airspace management coordination tools and message exchange capabilities, leading to progressively more flexible and dynamic airspace management. Airspace classifications should be harmonized across adjacent FIRs as defined in Annex 11.

3.5 It was noted that user-preferred routes make use of the capability of aircraft, based on a range of flight parameters. In accordance with this concept, States/Territories/International Organizations should encourage that ATS routes or tracks not be fixed to pre-determined routes or waypoints, except where required for control purposes; random routing permits defining areas within which routes are not designated and where aircraft may determine an appropriate track from an entry point to an exit point.

3.6 Also it was noted that collaborative airspace design and management should be aimed to improve airspace organization in a cooperative manner with all users so as to accommodate the preferred trajectories of the users. States/Territories/International Organizations should take advantage of aircraft capabilities when designing and implementing airspace changes, account needs to be taken of the fleet capabilities among airspace users within each given airspace. Collaboration with airspace users will permit appropriate procedures and/or solutions to be identified in accordance with available aircraft capabilities.

3.7 The flexible use of airspace (FUA) should not be designated purely as civil or military, but rather as a continuum in which all user requirements are accommodated to the greatest possible extent; should result in the removal of large tracts of permanent or transient restricted airspace or special use airspace, to accommodate specific individual airspace uses, thereby blocking airspace of certain dimensions should be on a transient basis. Collaborative decision making is an extension of the principles of the flexible use of airspace to include airspace users in flight in decision making with respect to tactical assessment of the use of reserved airspace and requirements for transit times of special use airspace.

Implementation of RNAV Routes and Required navigation performance (RNP)

3.8 The Meeting took note that after finalizing all the coordination, in late 2005 in the CAR/SAM Regions 54 ATS routes have been implemented, 44 have been realigned and 9 have been eliminated. The future strategy for RNAV/RNP implementation between city pairs including performance-based navigation (PBN) for en-route, terminal and approach flight phases should take into account the new ICAO provisions for the future RNAV and RNP implementation, as pointed out in Item 1 of this report.

3.9 It was noted that ICAO has scheduled for the second half of 2006 a seminar on Performance-Based Navigation (PBN) which objective is to provide to the States, Territories and International Organizations the new ICAO guidance material for planning and development of procedures and routes in terminal areas and approach in line with the requirements of airspace users and ATS service providers. Airports which have implemented GNSS procedures are:

AUA: Aruba	SDQ: Santo Domingo
NAS: Nassau	BGI: Barbados
STT: St. Thomas	GCM: Grand Cayman
STX: St. Croix	KIN: Kingston
SJU: San Juan	MBJ: Montego Bay
POS: Port of Spain	PLS: Providenciales
GDT: Grand Turk	PUJ: Punta Cana (Higuey)
FPO: Freeport	POP: Puerto Plata

RVSM Implementation

3.10 The Meeting noted the operational benefits obtained after RVSM implementation was based on a conservative price of the gallon of fuel of $ 1.98, resulting in a Cost/benefit ratio of 17:1 for North America, and 6:1 for the CAR/SAM Regions, obtaining a joint ratio of 15:1.

3.11 Taking into account the increase of the price of fuel in the past months, the benefits have been greatly exceeded; notwithstanding, before the economic crisis of most of the commercial airlines, it was noted the necessity to continue studies on new strategies on airspace management and planning of air operations to support the efficiency in the consumption of fuel and environment caretaking.

ATM Contingency Plans

3.12 The Meeting took note of the status of development of the ATM contingency plans in NAM and CAR Regions, as preventive measure for the possible total or partial disruption of air navigation services. Once the NAM and CAR Regions are composed by continental and oceanic areas susceptible to earthquakes, seaquakes and hurricanes that have caused great human and material losses in past years, the Meeting considered that States, Territories and International Organizations should also establish in their contingency plans additional measures facilitating the provision of humanitarian aid in case of natural disasters.

3.13 The Meeting recalled the deadline of GREPECAS to finish Contingency plans is June 30, 2006. Some States, Territories and International Organizations have foreseen contingency measures within their ATFM operational procedures and/or in Letters of Agreement with adjacent ATS units.

3.14 The meeting agreed that States, Territories and International Organizations should carry out efforts to increase airspace management efficiency, optimizing air routes and transfer points with the aim of decreasing the workload of pilots and controllers and facilitating the safe, orderly and timely flow of air traffic, which in turn would mean savings for airspace users. It was recognized that when adopting these changes, the civil aviation administrations should also consider the impact of the new technology on their sovereignty and national security, and the military operations among other things.

3.15 The Meeting noted that, as the ICAO Strategic Objectives are applicable to the regional and global ATM community, integrating work programmes and terms of reference of the different intra-regional Working Groups should therefore be reviewed taking into consideration the new Global Plan Initiatives (GPIs) and related ICAO on-line planning tools associated with future planning and implementation work.

3.16 The Meeting agreed that regional planning and implementation works should be reorganized keeping in mind the interests of the Region aimed at optimizing human resources, savings, as well as dynamic use of communication means between States such as internet video conference, teleconferencing, e-mail, telephone and facsimile, which should be encouraged during the intervening period.

3.17 The Meeting agreed to request ICAO NACC Office to reorganize the NAM/CAR regional work programme of future ATM meetings, improving the collaborative decision-making processes (CDM) and avoiding any unnecessary and duplication of work. The Meeting adopted then the following:

Recommendation ATM/6 REORGANIZATION OF THE ATM WORK PROGRAMMES IN THE NAM/CAR REGIONS

That ICAO:

a) review the integration of ATM work programmes and terms of reference of the different Working Groups of the NAM and CAR Regions; and

b) taking into account the new Global Plan Initiatives (GPI), develop a proposal for reorganizing in an homogeneous manner the ATM meeting programme of the different Working Groups for the effective implementation of the ATM system in the NAM/CAR Regions.

ICAO online Global Air Navigation Plan (ANP) database

3.18 The Meeting received a comprehensive presentation on ICAO Global Air Navigation Plan (GANP) database available online though an ICAO GIS portal to achieve a global ATM system; the performance-based approach to measuring success with implementation; and the planning process to carry out regional integration and transition to global ATM system. There are electronic planning tools developed by ICAO which characteristics are:

- Various formats: software applications, planning documentation, web-based reporting forms, project management tools
- Common programme templates as the basis for establishing performance objectives and implementation time lines
- Comprehensive schedule and programme planning activities
- Links to relevant guidance material and documentation in order to assist the planner throughout the planning process.

3.19 Also GIS provides for an interactive database links in a dynamic chart where the user selects what is to be displayed and functions, such as:

- Zoom in or out
- Input coordinate lat long
- Decide the area to be charted
- Search, query the map for data
- Perform spatial analysis
- Many output options (Extract function, Save as: pdf text tab ai, svg, jpg, special print functions).

5-letter name code (5LNC) assignment system

3.20 Another function of those electronic tools is the on-line assignment of 5-letter name codes (5LNC) using a global database, which objective is to expedite the process assisting States and the Regional Offices; final challenge is the elimination of the current 5LNC duplicity.

3.21 The database uses Internet-based tools and consists of two main components: Graphical User Interface (GUI) and Geographic Information System (GIS). The Internet-based GUI will allow users to view, search, reserve, allocate, modify and receive a confirmation of the assigned code. The GIS will allow to geographically visualizing all existing 5LNC in the world, in relation with aerodromes, runways, flight information regions (FIR), approach area, landing area, etc. The system offers tutorials that will allow users to learn to use the system at their own convenience.

3.22 In accordance with Conclusion 5/5 of the Fifth Meeting of All Planning and Implementation Regional Group (ALLPIRG/5) held in Montreal, Canada, from 23 to 24 March 2006, the Meeting concurred to use online global air navigation plan database tools, and adopted the following

Recommendation ATM/7 BEGIN TRIALS ON THE USE OF ICAO ELECTRONIC GLOBAL AIR NAVIGATION PLANNING TOOLS

That States/Territories/International Organizations of NAM/CAR Regions:

a) utilize the on-line electronic planning tools provided in ICAO web page as the common planning and implementation mechanism, ensuring proper coordination of regional and global integration;

b) review on a regular basis the progress achieved and challenges identified in the implementation process; and

c) provide feedback to the Secretariat on their possible improvements.

APPENDIX

ATM AGREEMENTS OF THE CENTRAL AMERICAN STATES AND COCESNA

English language proficiency

The Central American Air Safety Agency ACSA/COCESNA has taken the following actions:

a) Activation of a Central American ATC group of English specialists in order to develop a collaboration programme jointly with the FAA.

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b) In order to determine the English language proficiency level of the ATC personnel in Central America, in January 2006 evaluations were performed firstly to the COCESNA controllers and those of Costa Rica, it is scheduled to evaluate the ATC units of Nicaragua from 5 to 9 May, El Salvador from 15 to 17 May, Belize from 18 to 19 Mayo, Guatemala from 24 to 26 Mayo and finally Honduras from 31 Mayo to 05 June 2006.

ATS Letters of Agreemnt (LOAs)

With regard to the fulfillment of the signature of the ATS LOAs, before implementation of RVSM, in 2004, all the Central American States and COCESNA through their ATC units updated their operational LOAs, likewise COCESNA updated LOAs with the adjacent ACCs to the Central American FIR, achieving in that way complete agreements in the area.

Quality assurance Programmes

COCESNA	Has approved and implemented the Quality assurance Programme Manual and its Quality assurance Unit of the Air navigation Services is coordinated by Mr. Oscar Padilla.
GUATEMALA	The Quality assurance Programme document is in draft version and the ATS quality assurance unit is not yet organized.
EL SALVADOR	A group was designated to work in the ATS Quality assurance Programme document, they do not count with a draft version and the unit is not yet organized.
BELIZE	Have not yet developed the quality assurance Manual, there is no designated personnel to do this task.
HONDURAS	The Quality assurance Programme document is in draft version and the ATS quality assurance unit is not yet organized.
NICARAGUA	There is an organized quality assurance office, they are working in the ATS quality assurance Manual draft version.
COSTA RICA	Has approved the ATS Quality assurance Manual, the unit is not yet organized as there is no designated personnel to do this task.

SAR agreements and Contingency Plans

	SAR AGREEMENTS		CONTINGENCY PLANS	
COCESNA	BELIZE	2	BELIZE	2
	COSTA RICA	1	COSTA RICA	1
	EL SALVADOR	2	EL SALVADOR	2
	GUATEMALA	2	GUATEMALA	2
	HONDURAS	1	HONDURAS	1
	NICARAGUA	1	NICARAGUA	1
BELIZE	COCESNA	2	COCESNA	2
	COSTA RICA	N/A	COSTA RICA	N/A
	EL SALVADOR	N/A	EL SALVADOR	N/A
	GUATEMALA	2	GUATEMALA	2
	HONDURAS	2	HONDURAS	2
	NICARAGUA	N/A	NICARAGUA	N/A
COSTA RICA	COCESNA	1	COCESNA	1
	BELIZE	N/A	BELIZE	N/A
	EL SALVADOR	N/A	EL SALVADOR	N/A
	GUATEMALA	N/A	GUATEMALA	N/A
	HONDURAS	N/A	HONDURAS	N/A
	NICARAGUA	1	NICARAGUA	1
EL SALVADOR	BELIZE	N/A	BELIZE	N/A
	COCESNA	2	COCESNA	2
	COSTA RICA	N/A	COSTA RICA	N/A
	GUATEMALA	2	GUATEMALA	2
	HONDURAS	2	HONDURAS	2
	NICARAGUA	2	NICARAGUA	2
GUATEMALA	BELIZE	2	BELIZE	2
	COCESNA	2	COCESNA	2
	COSTA RICA	N/A	COSTA RICA	N/A
	EL SALVADOR	2	EL SALVADOR	2
	HONDURAS	2	HONDURAS	2
	NICARAGUA	N/A	NICARAGUA	N/A
HONDURAS	BELIZE	2	BELIZE	2
	COCESNA	1	COCESNA	2
	COSTA RICA	N/A	COSTA RICA	N/A

	SAR AGREEMENTS	**CONTINGENCY PLANS**		
	EL SALVADOR	2	EL SALVADOR	2
	GUATEMALA	2	GUATEMALA	2
	NICARAGUA	2	NICARAGUA	2
NICARAGUA	BELIZE	N/A	BELIZE	N/A
	COCESNA	1	COCESNA	1
	COSTA RICA	1	COSTA RICA	2
	EL SALVADOR	2	EL SALVADOR	2
	GUATEMALA	N/A	GUATEMALA	N/A
	HONDURAS	2	HONDURAS	2

NOTES: 1 = Signed 2 = On-going N/A= Non applicable

Agenda Item 4: Programmes related with the implementation of an Air Traffic Management (ATM) safety management system, Air Traffic Services (ATS), incidents investigation and runway safety (runway incursions) Quality Assurance.

ATM safety management system

4.1 The Meeting recognized that ATS Quality Assurance Programmes have proven to be an efficient tool which fosters enhancements on ATM safety management through the establishment of several complementary programmes for the assessment of ATS performance such as the programmes of incidents notification and investigation; incidents prevention; verification and training for ATC proficiency; proficiency in the use of aeronautical language and of English language; and verification of the use of aeronautical phraseology.

4.2 In spite that these implementations have been successful in reducing incidents, there is still a large number of human factors errors concerning the ATC coordination cycle, therefore, the Meeting considered necessary the systemic implementation of other aspects regarding ATM performance assessment in order to attain an evolution towards an effective regional ATM safety management systems in the NAM and CAR Regions.

4.3 The implementation of an ATM safety management programme will require defining related performance objectives, and that suitable regional mechanism allowing to prove that these objectives are being met be established, which implies undertaking new tasks to measure the performance of the ATM system. Among these aspects are: sharing information on incidents and accidents on the web, the classification of risk and the suitable measures for its solution, as well as the regional collaboration for the harmonization and exchange of experiences.

4.4 It was considered that the ECCAIRS (European Co-ordination Centre for Aviation Incident Reporting Systems) adopted by ICAO are an effective means to implementing and harmonizing taxonomies to facilitate the exchange of occurrence data between States/Territories and between States/Territories and ICAO. The ECCAIRS software is available to States/Territories at no cost and ICAO will distribute it through the Regional Offices.

4.5 Taking into consideration this information, the Meeting approved the following:

Recommendation ATM/8 REGIONAL ATM SAFETY MANAGEMENT SYSTEM

That the States/Territories/International Organizations of the NAM/CAR Regions:

a) take the necessary actions for the implementation of an ATM safety system which ensures air navigation service providers the implementation of a Safety Management System in accordance with the new ICAO Annex 11 guidelines;

b) establish the acceptable levels and objectives with regard to safety, within the airspace and aerodromes of their jurisdiction;

c) consider the use of ECCAIRS (European Coordination Centre for Aviation Incident Reporting Systems) as a means for classification of incident and accident taxonomies;

d) promote an ATM safety culture in accordance with ICAO Doc 9859 guidelines;

e) foster analysis and co-operation meetings among their related specialists in order to share experiences for the effective implementation of ATM safety programmes; and

e) participate in the activities carried out by ICAO in order to facilitate the implementation of a regional ATM safety management system.

Agenda Item 5: New strategies for the implementation of the regional and global air traffic management (ATM) system.

Air Navigation Plan - North Atlantic, North American and Pacific Regions (Doc 8755)

5.1 The Meeting noted that the information contained in Doc 8755, NAT/NAM/PAC ANP was not up-to-date, and considering that all the ANP documents have been restructured to a new format containing two volumes: Basic and Facilities and Services Implementation Document (FASID), it deemed appropriate to correct the inconsistencies indicated as follows:

1. delete all the information in Document 8755 relating to the NAT and PAC Regions;
2. restructure the document into two parts: Basic and FASID; and
3. amend the information concerning the North American Region to include the set of planning criteria and as well as the requirements for facilities and services necessary to serve international civil aviation, among the States of the region.

5.2 The information should include the Basic Operational Requirements and Planning Criteria (BORPC) as approved by the Air Navigation Commission (ANC), the global ATM operational concept, the revised Global Air Navigation Plan as well as domestically or regionally produced documentation. The FASID would then contain detailed information on facilities and/or services to be provided by States in order to fulfill the basic requirements contained in the Basic ANP.

5.3 Considering the need for harmonizing the ANP for the NAM Region (Doc 8755), the Meeting adopted the following:

Recommendation ATM/9 UPDATE OF NAT/NAM/PAC ANP (DOC 8755)

That ICAO Regional North American, Central American and Caribbean Office:

a) restructure the NAT/NAM/PAC ANP (Doc. 8755) into two volumes: Basic and FASID eliminating the information corresponding to the NAT and PAC Regions; and

b) develop, in coordination with the States involved, an update of the Regional Air Navigation Plan for the North American (NAM) Region.

Agenda Item 6: Other business

6.1 Dominican Republic presented an Information Paper on the work of Air Traffic Management System Automation supporting safety in this State.