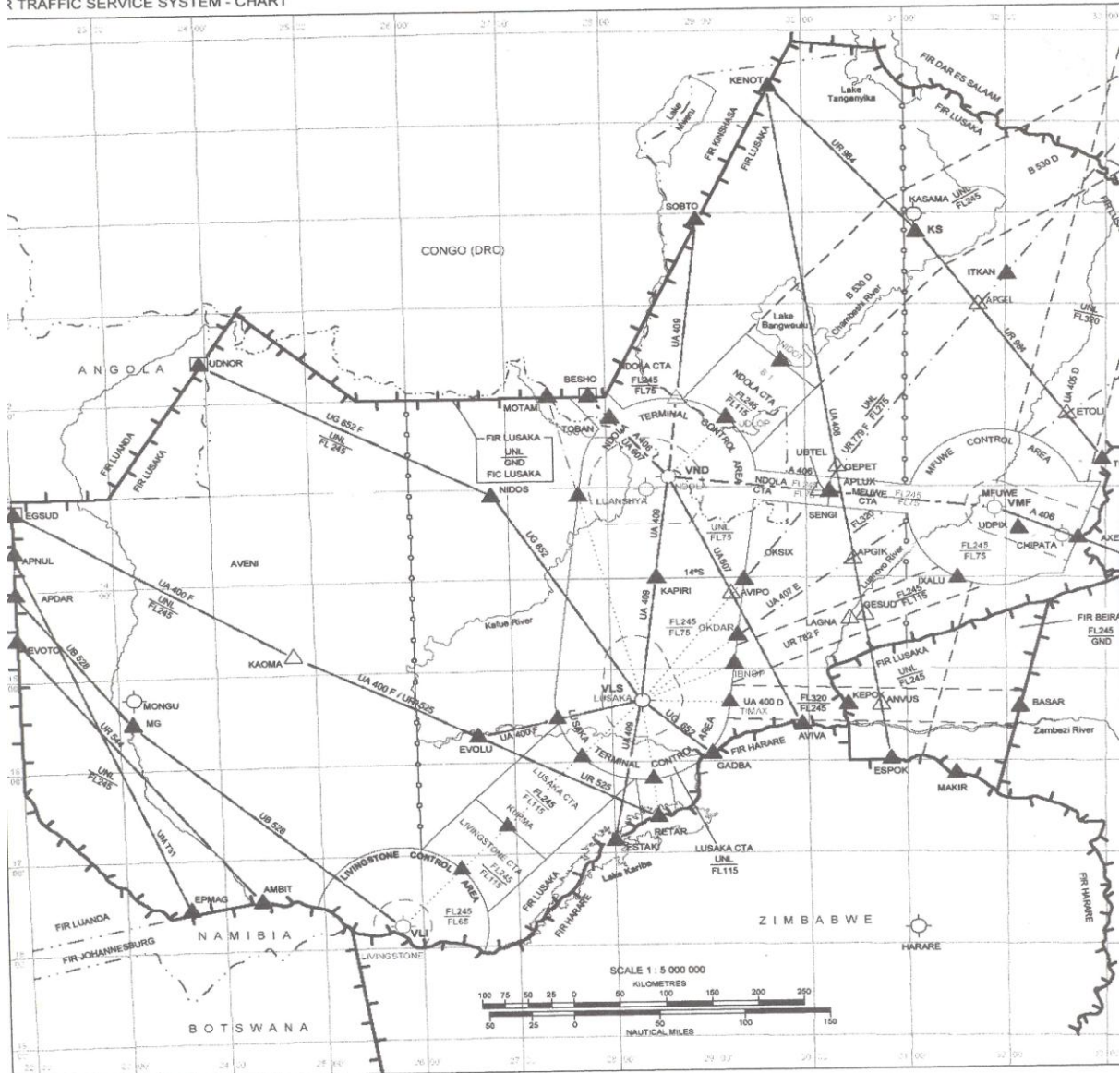


**WORKSHOP ON THE DEVELOPMENT OF  
NATIONAL PERFORMANCE FRAMEWORK FOR AIR NAVIGATION SYSTEMS  
(NAIROBI, 6-10 DECEMBER 2010)**

**ZAMBIA**

TRAFFIC SERVICE SYSTEM - CHART



## About Zambia

1. Zambia is a landlocked country covering land mass of about 750, 000 square Km with good land scape and flat land areas and in land waters e.g. lakes and rivers including mighty Zambezi river.
2. Surrounded by eight neighbouring states.
3. Zambia is very much known for its copper and many other minerals.
4. It has very rich game parks, national parks and many game management areas.
5. Victoria falls in Livingstone provides one of the seven wonders of the world. This, everyone must visit in life time.
6. Above all Zambia is a very peaceful country worthy visiting and perhaps investing there too.

***VICTORIA FALLS- Livingstone***



## 1.0 CHARATERISTICS OF INDUSTRY

The country`s aviation industry is divided into regulatory functions and service provision. The regulatory functions are carried out by the department of civil aviation, a government institution while National Airports Corporation is an ATM service provider and so are different aircraft operators. The Department of civil aviation is currently undergoing transition from government body to autonomous civil aviation authority.

1.1 International and domestic Airlines that are servicing the four designated Zambian airports are listed below.

In the year under review the Airports were serviced by the following airlines:

INTERNATIONAL	LUSAKA	LIVINGSTONE	NDOLA	MFUWE
South African Airways	✓	✓	x	x
Kenyan Airways	✓	x	x	x
South African Airlink	✓	x	✓	x
BA- Comair	x	✓	x	x
Zambezi Airlines	✓	✓	✓	✓
Ethiopian Airlines	✓	x	x	x
British Airways	✓	x	x	x
Air Zimbabwe	✓	x	x	x
Air Malawi	✓	x	x	x
Angola Airlines	✓	x	x	x
Zambian Airways*	✓	✓	✓	✓
Nationalwide*	x	✓	x	x
Inter Air*	x	✓	x	x
DOMESTIC				
Proflight	✓	✓	✓	✓
Staravia	✓	✓	✓	✓
Avocet	✓	✓	✓	✓
Sefofane	✓	✓	✓	✓
Star of Africa	✓	✓	✓	✓
Zamfari	✓	✓	x	✓
Ngwazi Air Charter	✓	x	✓	x
CARGO				
MK Airlines	✓	x	✓	x
SA Cargo	✓	x	x	x
Cargo Lux	✓	x	✓	x

\* Ceased to operate during the year under review.

## 1.2 The 2009 Air traffic flow and passenger statistics.

### 1.2.1 Air Traffic Movement for the period 2007 to 2009

	2008/2009	2007/2008	Variance	% Growth
Lusaka	27,331	24,122	3,209	13.3
Livingstone	9,541	9,130	411	4.5
Ndola	11,115	9,586	1,529	5.9
Mfuwe	4,907	3,876	1,031	26.5
Total	52,894	46,714	6,180	13.2

### 1.2.2 Passenger Movement for the period 2007 to 2009

The total passenger traffic for the year under review is summarized as below;

2007/08	Domestic Passenger	195,660
2007/08	International Passengers	898,616
2007/08	Total Passengers	1,094,276
2008/09	Domestic Passengers	252,789
2008/09	International Passengers	876,056
2008/09	Total Passengers	1,128,845

Domestic Passenger percentage growth	29%
International Passenger percentage growth	(2.5) %
Total Passenger percentage growth	3%

#### 2.3 Passenger Traffic by Airport (2007/8 Vs 2008/9)

The growth in the individual airports was distributed as follows;

	2008/2009	2007/2008	Variance	% Growth
Lusaka	747,801	711,855	35,946	5
Livingstone	195,609	205,598	(9,989)	(4.9)
Ndola	157,186	151,861	5,325	.5
Mfuwe	28,249	24,962	3,287	13
Total	1,128,845	1,094,276	34,569	3

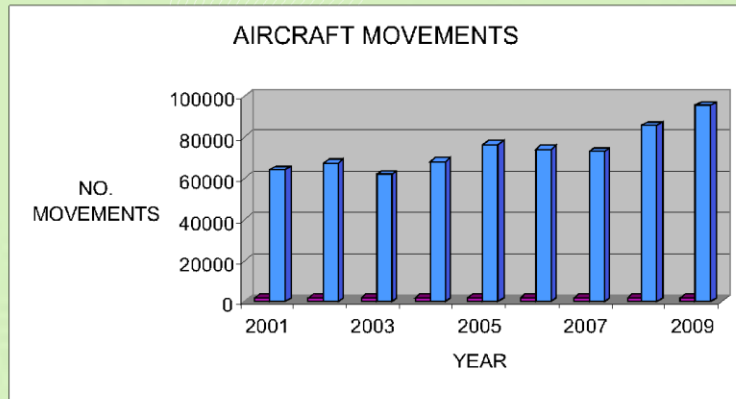
### 1.2.3 Aircraft Movements 2001-2009

#### 3.2.1 Aircraft Movements

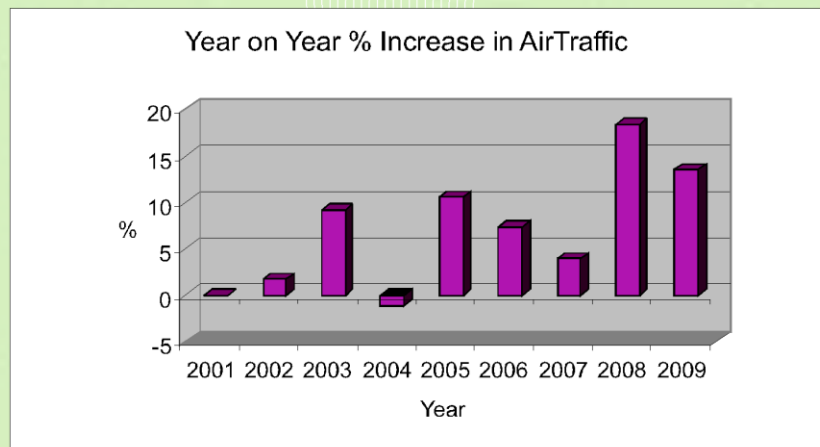
A total of 95,265 movements were handled during the financial year 2008/2009. These movements represented a 13.45% increase over 85,5728 movements handled in the 2007/2008 accounting period.

Despite the increase in traffic, trend of increase on year on year showed a drop from 18.5 to 13.45% compared to the previous year. This indicated a beginning of effects of a global economic recession whose full impact may be felt in 2009/2010 financial year.

#### 3.2.2 Aircraft Movement Progression Chart



### 1.2.4 Yearly traffic Increment 2001-2009



### 1.2.5 Projected Growth

Year	International	Domestic	Total	CAGR
Historical				
2007	594,505	90,756	685,261	--%
2008	644,795	128,970	773,765	12.9
Forecast				
2009	549,000	93,000	642,000	-17.0%
2010	571,000	98,000	669,000	4.2
2011	608,000	103,000	711,000	6.3
2012	645,000	109,000	754,000	6.0
2015	754,000	126,000	880,000	5.3
2020	939,000	157,000	1,096,000	4.5
2030	1,357,000	228,000	1,585,000	3.8
CAGR				
2009-2020	5.0%	4.9%	5.0%	
2020-2030	3.8	3.8	3.8	
2009-2030	4.4	4.4	4.4	

### 1.3. Efficiency Challenges

1. Delays in the landing rates and increased runway occupancy as a result of using NDB/VOR approaches these result in the following
  - Uneconomical fuel consumption
  - Environment pollution
  - Increased controller workload
2. Increased separation minima in all phases of flight(10minutes for example=80Nm on average between aircraft
3. Missed approaches and diversions in marginal weather conditions as a result of high decisions heights due to conventional landing aids.
4. Non continuous availability of navigational aids as a result of outages of terrestrial navigation aids.
5. Non optimal aircraft sequencing due to lack of surveillance and GNSS systems.
6. Loss of revenue as a result of aircraft routing away from the Zambian airspace as a result of traffic congestion due to non implementation of RNP
7. Poor runway and taxiway lay out.
8. Inflexible use of airspace due to segregated airspaces.
9. Non direct route structures as a result of using terrestrial NAV Aids (conventional)

## 2.0 Organisation providing Air Navigation Service

### Background

National Airports Corporation Limited was established by an Act of Parliament no.16 of 1989 as quasi-autonomous government body corporate. It is incorporated as an amendment to the Aviation Act, Cap 444 of the laws of Zambia. It is a company limited by shares and registered under the companies' Act Cap 388 of the laws of Zambia.

The company commenced operation on 11th September, 1989 under Act number 16 of 1989 which is incorporated in Aviation Act chapter 444 of the laws of Zambia.

National Airports Corporation is responsible for four designated airports, Lusaka, Ndola, Livingstone and Mfuwe. Its shares are 100% owned by the government of Zambia. The company's vision is to be the leading provider of world class airport and air navigation services and the mission is to "Develop and manage airport and air navigation infrastructure to international standards, meeting shareholders values while profitably contributing to the national economic development"

### 2.1 Capital Structure (Source of revenue)

National Airports Corporation Generates its income from the following sources:-

- Navigation charges
- Landing charges
- Parking fees
- Office space rentals
- Advertisements and concessions
- Passenger Service charges
- Ground handling
- Air navigation charges
- Government support on capital projects (requisition of Navigational aids & RWY resurfacing etc).

### 2.2 Principal shareholders and management

Principal Shareholders: National Airports Corporation Limited is wholly owned by the government of Zambia

### 2.3 Management:-

Managing Director is the chief executive officer of the corporation. Directors help him to run the company as follows:

Director -Air Navigation Services is responsible for air the navigation service which has the following units:

- Air Traffic Control
- Aeronautical Information Services

- Telecommunications Section
- Quality assurances
- Information Technology

Director-Airports is responsible for airport services which include the following:

- Security
- Ground Handling
- Engineering
- Rescue Fire Services

Director-Finance heads the finance department;

Human Resources Department; and the

Legal Department responsible for all the legal issues including the following:

- Purchasing
- Transport

### 3.0 Major stakeholders/partners

#### 3.1. Aerodrome community

- Airports Corporation Limited
- General residents

#### 3. 2. Airspace providers

- State

#### 3.3. Airspace users

<b>AIR SPACE USERS</b>		
Zambia Air Force	South African Air link	Avocet Air charters
Zambezi Airlines	Air Malawi	Rwandan Airlines
South African Airways	Air Zimbabwe	Katanga Air
Kenya airways	DHL	Angola Airlines
Ethiopian Airlines	Cargo Lux	Proflight commuters
Namibian Airlines	British Airways	Staravia charter company
Dutch Airlines	Air Zimbabwe	Ngwazi Air charters
Com Air	Turkish Airlines	Air Portugal
Israel Airlines	Air France	



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3.4. ATM service provider

- National Airports Corporation Limited(NACL)

3.5. ATM support industry

<b>ATM SUPPORT INDUSTRY</b>				
Zambia Air services Training Institute	Zambia Export Growers Association	Aircraft maintenance organisations	NAC 2000	Catering services
Health Care providers	Zambia air force	AOOA	Operating Air lines	

3.6. International Civil Aviation Organisation (ICAO)

3.7. Regulatory authority

- Department of Civil Aviation
- Ministry of Communication and Transport

3.8. State

3.9. Funding sources

- ATM service provider

<b>FUNDING SOURCES</b>				
Passenger service charge	Ground handling charges	Landing fees	Parking fees	Air navigation charges
Office space rentals	Advertisements and concessions	Government funding		

**4. Problem definition**

1. Poor V HF/HF coverage in the lower airspace
2. Lack of situational awareness (surveillance)
4. Poor utilisation of airspace capacity due to use of conventional navigation systems
5. Poor MET service provision
6. Procedural control environment

7. Delays in the landing rates and increased runway occupancy as a result of using NDB/VOR approaches these result in the following
  - Uneconomical fuel consumption
  - Environment pollution
  - Increased controller workload
8. Increased separation minima in all phases of flight(10minutes for example=80Nm on average between aircraft
9. Missed approaches and diversions in marginal weather conditions as a result of high decisions heights due to conventional landing aids.
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## **5. Performance based National Air Navigation Plan**

ICAO Assembly Resolution A36-23 calls for each State to develop a national PBN implementation plan by 2009. The "PBN Implementation Plan" is not stand-alone, but part of the global plan for development of aviation. Zambia has partially met its obligation with regard to conversion to the WGS-84 coordinate system in the terminal areas, but has not done so in the en-route portions and is yet to develop RNAV (GNSS) procedures for Ndola and Mfuwe airports and WGS 84 is the basis for PBN operations.

The major traffic flows are predominantly North-South, North east and vice versa. The major routes servicing these traffic flows are:

UG 655, UM 214, UM 215, UM 731, UA 405(North-South/ vice versa) and UR 779 (North-East / Vice versa).

Zambia`s vision is to timely achieve a seamless Global ATM system in accordance with the AFI plan. To achieve this, the country has established the following performance objectives:

- Enhance terminal area efficiency
- Enhance airport capacity and efficiency
- Enhance en-route and terminal capacity and

- Enhance ATM effectiveness.
- Enhance aerodrome safety
- Enhance situational awareness

Zambia has already implemented GNSS (RNAV) procedures at Livingstone and Lusaka international airports and there plans to implement at Ndola and Mfuwe airports.

The current air navigation system infrastructure architecture to support ATM operational concept are as follows:

Communication – VHF (voice), HF (voice & data), AFTN, VSAT (Voice & data)

Navigational aids – DVORs, VORs, DMEs, ILS, NDBs, VDFs

Surveillance – Nil

### **Air Traffic Management**

Airspace organisation – Lusaka FIR

TMA's - (Lusaka and Ndola TMA's)

CTA's - (Livingstone and Mfuwe CTA's)

CTR's – (Lusaka, Ndola, Livingstone & Mfuwe)

Air space Management

- Fixed and flexible use of air space. Combination of flexible and fixed use of airspace exists. Flexible airspace – NOTAM issued prior to segregation.

Inflexible air space - Totally prohibited.

Civil/military coordination – Fixed annual and ad hock meetings for civil/military in place. MOU in place between civil and military authorities.

Air Traffic services

- Conflict management

Conflicts resolved through route structure infrastructure and application of ICAO separation standards.

- Search and Rescue

Department of Civil Aviation is responsible. MOU signed with relevant stakeholders including the Air Force.

- Decision support system – future requirement
- Separation standards – conventional separation standards followed
- Applications – No data link communications at the moment.

#### Aeronautical Information management (AIM)

Functions - Timely processing and dissemination of aeronautical data

#### Aerodromes

- Aerodrome design
  - Visual aids
  - Runway incursions
  - Runway excursions
  - RFS
  - Aerodrome emergency plans

#### Aeronautical meteorology

- Terminal Area Forecast
- Metars
- Species
- Route forecast
- Volcanic ash
- Trend forecast
- Wind shear warnings
- Clear air turbulence

STRATEGIC OPERATIONAL FORMS FOR IMPROVEMENT/

NATIONAL PERFORMANCE OBJECTIVE – 1

**ENHANCE TERMINAL AREA EFFICIENCY**

Performance Benefits

Safety	1. Safety level improved
Environment	1. Reduced emissions through shorter flights and use of optimum routes trajectories. 2. Reduced noise
Capacity	1. Increased capacity through increased landing frequency
Cost effectiveness	1. Reduced fuel consumption through direct routing. 2. Reduced man-hours for crew

Performance Management

Metrics	1. Number of required PBN routes to be implemented
	2. Percentage difference between optimal and actual route
	3. Number of aircraft entering a specified volume of airspace/hr
	4. Pounds of fuel burn per operation
	5. Percentage of time the fixed airspace unavailable to civil users

Strategy Medium term (2010 – 2015)

ATM OPERATIONAL		Timeframe		
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CONCEPT COMPONENTS	Projects/Tasks	Start/End	Responsibility	Status (as of...)
AOM, DCB, TS AND CM	1. Develop WGS-84 surveys  For terminal areas for Mfuwe and Ndola	2011 - 2012	NACL	To be budgeted for 2011
	2. Develop RNAV procedures  For Ndola and Mfuwe airports	2011 - 2012	NACL	To be budgeted for 2011
	3. Training of ATM personnel for GNSS procedures and conflict management	2011 - 2012	NACL	To be budgeted for 2011
	4.			
Risk Management	Risk factors: lack of funding; Delay in aircrafts equipage; insufficient databases			
	Risk mitigation ; identification of different funding sources; involvement of aircraft operators in the decision making.			
Linkage to GPIs	GPI/1-Flexible use of airspace;GPI5/-RNAV and RNP;GPI/6-Air Traffic Flow Management, GPI/7-Dynamic and Flexible Air Traffic Route Management, GPI/8-Collaborative airspace design and management; GPI/9-Situational awareness; GPI/10-Terminal area design and management, GPI/11- RNP and RNAV SIDS and STARS, GPI/12- Functional integration of ground systems with airborne systems; GPI/15-Match IMC and VMC operating capacity; GPI/16-Decision support systems and alerting systems; GPI/17-Data link applications; GPI/18-Aeronautical information; GPI/19-Meteorological systems, GPI/20-WGS-84;GPI21-Navigation systems; GPI/22-Communication infrastructure; GPI/23-Aeronatical Radio spectrum			

STRATEGIC OPERATIONAL FORMS FOR IMPROVEMENT/  
NATIONAL PERFORMANCE OBJECTIVE – 2  
**Enhance Aerodrome safety**

Performance Benefits

Safety	1. Safety level improved
Environment	1. Reduced environment pollution from accident spills and combustion emissions
Capacity	1. Increased capacity through reduced delays caused by accidents and damage to infrastructure.
Cost effectiveness	1.Reduced insurance premiums

Performance Management

Metrics	1. Number of safety related incidents reported
	2. Percentage difference between incident occurrence prior and post implementation
	3. Number of arriving and departing aircraft per hour

Strategy Medium term (2010 – 2015)

ATM OPERATIONAL CONCEPT COMPONENTS	Projects/Tasks	Timeframe Start/End	Responsibility	Status (as of...)
AOM, DCB, TS AND CM	1. Formulate and implement safety Management System program.	January 2011- September2015	State/NACL	Data base under preparation

	2.Development of procedures to enhance aerodrome safety	January - June 2011.	State/NACL	Budgeted for 2011
	3.Training of controllers, aerodrome personnel and aerodrome inspectors.	January – December 2011	State/NACL	Budgeted for 2011
	4.Devise methods of reducing bird strikes	January – December 2011	January – December 2011	Program developed
	5.			
	6.			
Risk Management	Risk factors: lack of funding; human factor; insufficient qualified personnel.			
	Risk mitigation; identification of different funding sources; involvement of aircraft operators in the decision making.			
Linkage to GSIs	GS 1. Consistent implementation of international standards and Industry best practices GS 2. Consistent regulatory oversight GS 3.Effective incident and accident reporting GS 4. Sufficient numbers of qualified personnel			

END