

**WORKSHOP ON THE
DEVELOPMENT OF
NATIONAL PERFORMANCE
FRAMEWORK FOR AIR
NAVIGATION SYSTEMS
KENYA**

**Presented by;
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Industry Characteristics

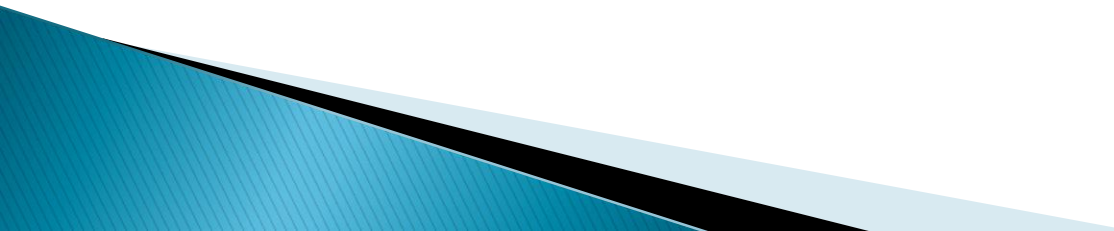
Aircraft movements;

- ▶ 2009/10; 308,130
- ▶ Projected movements 2010/11; 317374
- ▶ Current growth: 5.6 % per annum
- ▶ Projected growth: 3% per annum

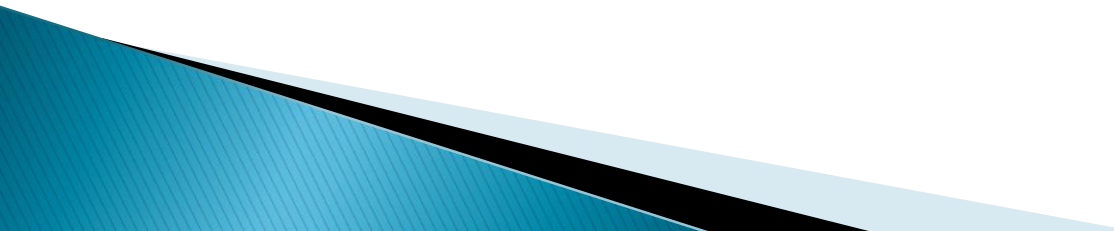
Efficiency Challenges: Airport capacity:
runways and taxiway configurations, parking
and passenger handling, Airspace
restrictions, Equipment costs, Staffing,
Improvement of infrastructure

Air navigation Service Provider

Institutional format and management:

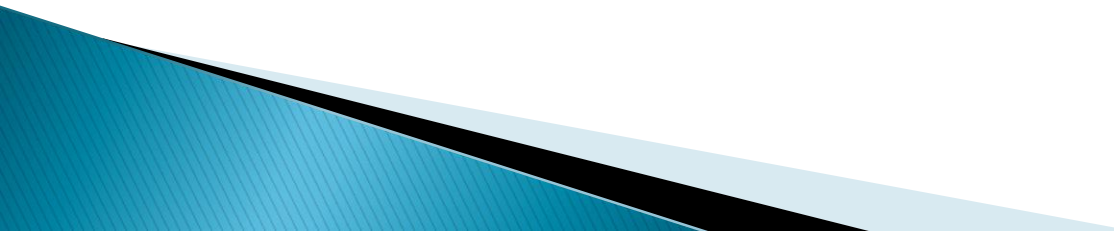
- ▶ Autonomous Civil Aviation Authority run by a Board of Directors and managed by a Director General.
 - ▶ It provides both Regulatory and Air Navigation Services. The Air Navigation Services is a Directorate headed by a Director.
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ANSP cont.

- ▶ This Directorate is responsible for the operation and delivery of a range of air navigation services which include:
 - ▶ Air Traffic Management :
 - ▶ Aeronautical Information Services:
 - ▶ Engineering Services (CNS)
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ANSP cont.

Capital structure

- ▶ The ANSP derives its revenue almost entirely from user Charges
 - ▶ **Principal shareholders: Government of Kenya**
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Major stakeholders / partners

- ▶ **Partners:**

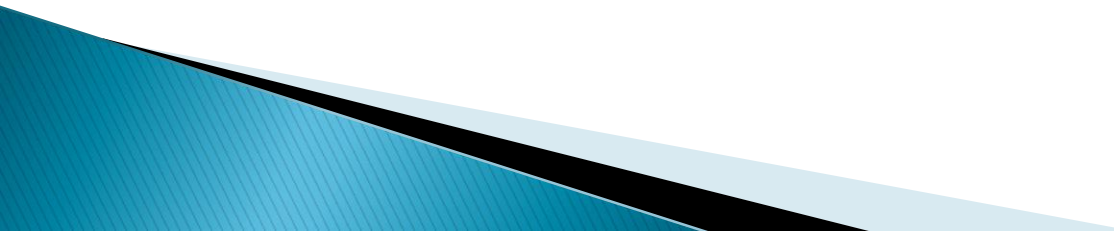
Kenya Government, ICAO, IATA, EAC, AFCAC, Kenya Airports Authority, Kenya Meteorological Department, Kenya Air force, Kenya Army, Kenya Airways, Jet Link, East African, Fly 540, Kenya Wildlife Services, Kenya Association of Air Operators, Kenya Police, Kenya Maritime Authority, Communication Commission of Kenya, Kenya Power & Lighting.

Potential funding sources

- ▶ Government of Kenya
 - ▶ World Bank
 - ▶ Commercial and Development Banks
 - ▶ Other Development Partners
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Problem definition

Limitations of Conventional Air Navigation Systems:

- ▶ Availability, reliability and integrity of facilities
 - ▶ Unreliability of Power Supply
 - ▶ High maintenance costs
 - ▶ Inadequacy of skilled Staff
 - ▶ Inadequate coverage
- 

Geographical scope

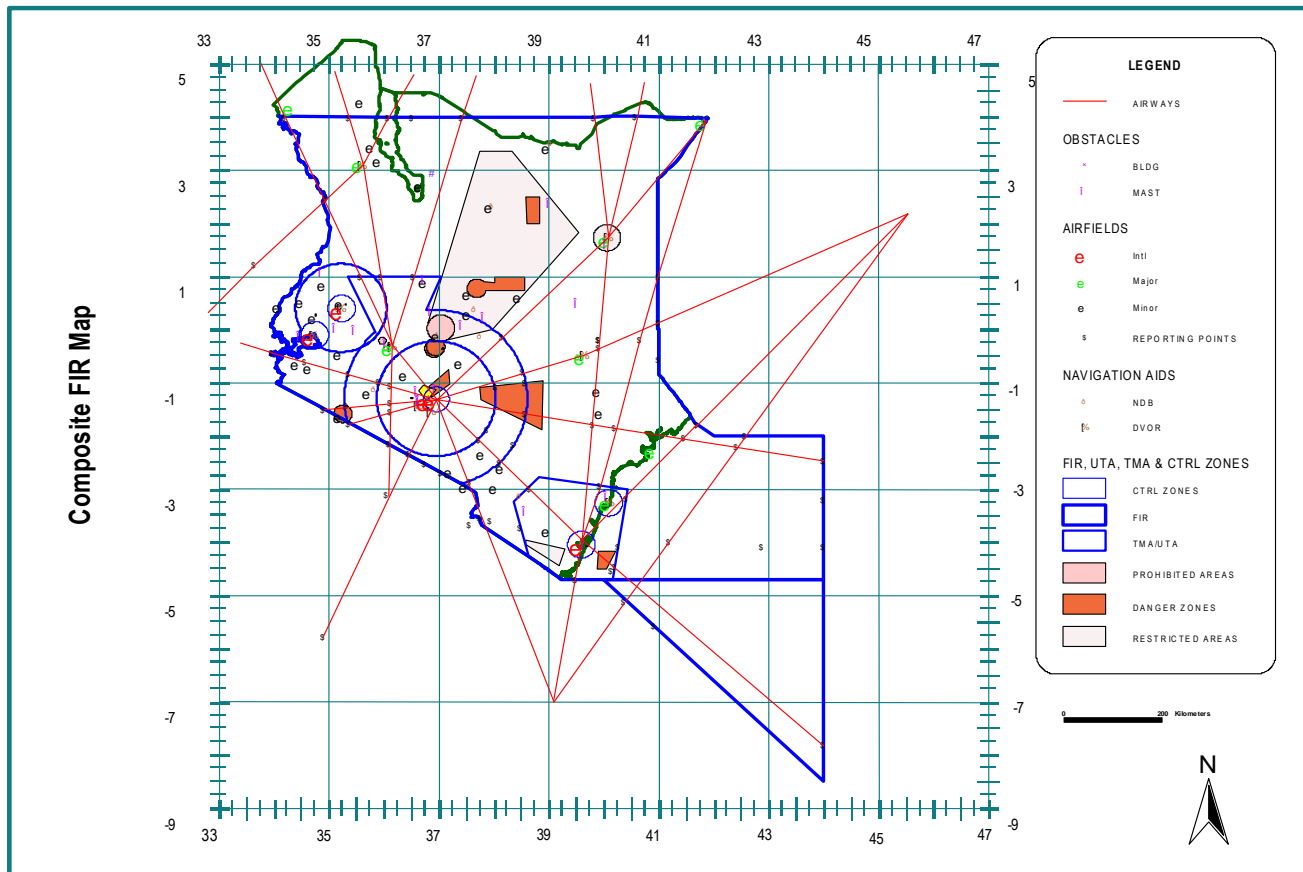


Fig 4.1: Map showing the Airspace Zones, Control Areas, Obstacles, Airways, Reporting Points and Navigation Aids.

Geographical scope cont.

The geographical scope of the National Air Navigation Plan:

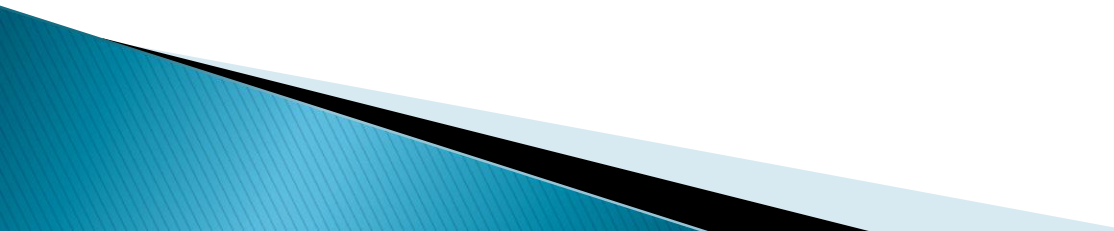
- ▶ Nairobi Flight Information Region

The major traffic flows:

- ▶ Nairobi – Europe
 - ▶ Nairobi – West Africa
 - ▶ Nairobi – Middle East
 - ▶ Nairobi – Southern Africa
 - ▶ Nairobi – Mombasa
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Vision

To achieve an interoperable national air traffic management system for all users during all phases of flight, that;

- ▶ **meets agreed levels of safety;**
 - ▶ **provides for optimum economic operations;**
 - ▶ **is environmentally sustainable; and**
 - ▶ **meets national security requirements.**
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National Performance Objective

Improvements to the Air Navigation System that considers operating environments and priorities specific to Kenya;

- ▶ Restructure the Airspace
- ▶ Modernize CNS/ATM facilities
- ▶ Implement new Flight Plan
- ▶ Implement electronic AIS System
- ▶ Improve runway and terminal capacity
- ▶ Improve on content, format and timeliness of Aeronautical Meteorological Information

Current air navigation systems

- ▶ VHF, HF, AFTN, ATS-DS, AIDPS, ILS, VOR, DME, NDB, VDF, GNSS, SSR and PSR, and AWOS, SADIS and Alphanumeric Codes

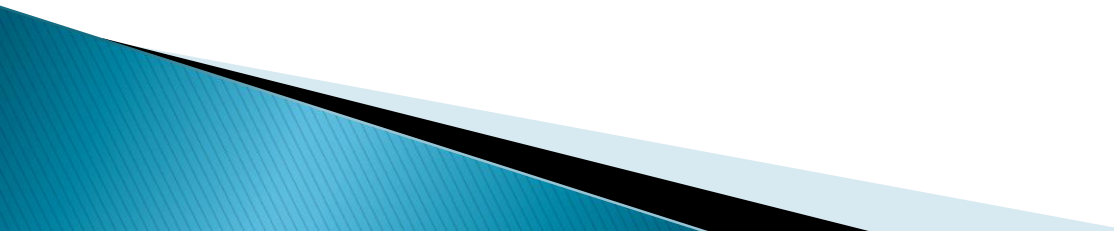
Future air navigation systems

- ▶ Data links, PBN, ADS, Multilateration Systems, ATN, DATIS, GBAS, SBAS, WAFS, TCAC, VAAC, SADIS/ISCS, XML Codes, Wind shear and Aerodrome Weather warning System Surface Movement Radar

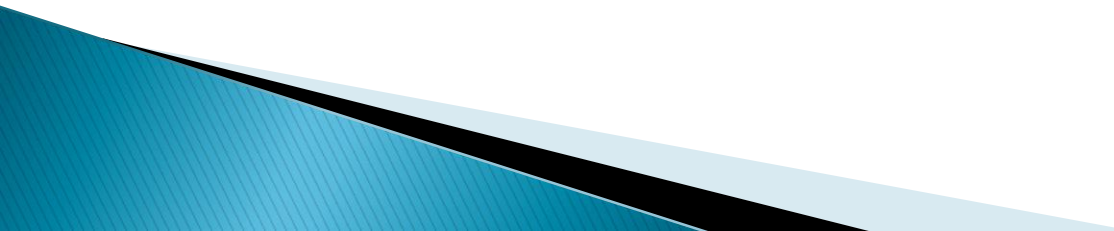
Gap(s)

- ▶ Data links, PBN, ADS, Multilateration Systems, ATN, DATIS, GBAS, SBAS, WAFS, TCAC, VAAC, SADIS/ISCS, XML Codes, Wind shear and Aerodrome Weather warning System , Surface Movement Radar

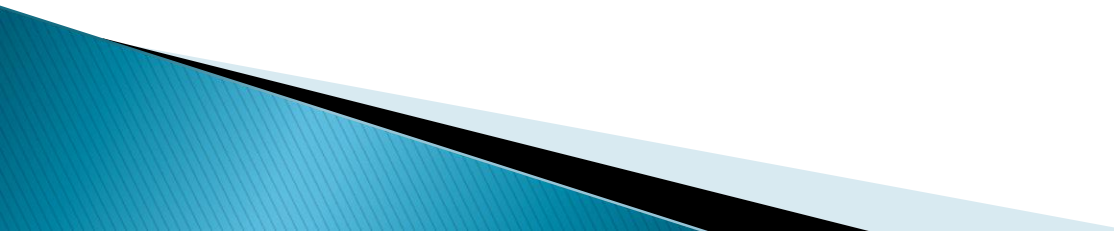
Near term operational improvements

- ▶ DATIS, ADS-C,
 - ▶ CPDLC
 - ▶ Wind shear and Aerodrome Weather warning System
 - ▶ Surface Movement Radar
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Medium term operational improvements

- ▶ Data links
 - ▶ PBN
 - ▶ ADS-B
 - ▶ Multilateration Systems
 - ▶ ATN, GBAS, SBAS, WAFS, TCAC, VAAC, SADIS/ISCS
 - ▶ XML Codes.
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END
THANK YOU/AHSANTENI



**STRATEGIC OPERATIONAL IMPROVEMENT/
NATIONAL PERFORMANCE OBJECTIVE**

RESTRICTURE THE AIRPSACE TO ENHANCE CAPACITY

Performance Benefits

Safety	1. Safety level improved
Environment	1. Reduced emissions through use of optimum routing 2. Noise abetment through improved procedures
Capacity	1. Enhanced capacity through optimum utilization of airspace 2. Reduced flight delays

Performance Measurement

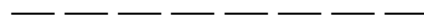
Metrics	1. Number of PBN routes implemented
	2. Percent difference between optimal and actual route
	3. Number of aircraft entering a specified volume of airspace/hr
	4. Amount of fuel burn per operations
	5. Number of delays due to ATC clearances

Strategy

Medium term (2010 - 2015)					
ATM Operational Concept Components	Projects/Tasks	Timeframe Start/End	Responsibility		Status (as of ...)
AOM, DCB, TS and CM	1. Review ATS routes structure	January 2010 - December 2014	ANSP		Implemented 5 new route as of Dec 2010
	2. Implement new PBN routes				
	3. Develop new instrument flight procedures				
	4. Implement enroute RADAR services	January 2011-June 2011	ANSP		Personnel training on-going
	5. Implement flexible use of airspace, improve civil/military co-ordination.	January 2010-June 2011	ANSP and DOD		Discussions initiated
	6. Improve demand and capacity balancing through ATFM process	Jan2012- Dec 2015	ANSP		
Supporting tools	1. Technology evaluation and gap analysis				
	2. Safety case and safety analysis				
	3. Business case and cost benefit analysis				
	4. Regional workshops and seminars				

ATM Community members	Aerodrome operators, Airspace users, ATM support industry, Regulatory authorities and ICAO
ATM Community expectations	1. Right of access to ATM resources and equity for all users
	2. Capacity to meets peak demands, while minimizing restrictions
	3. Cost effective air navigation services
	4. Minimize environmental impact
	5. Flexibility in adapting flight trajectories
	6. Technical and operational interoperability and harmonization
	7. Consistent and dependable levels of service
	8. Safety is highest priority
Project Output	National performance plan for implementation of air navigation system elements that are operationally suitable, technically feasible and economically viable.
Project Outcome	Enhanced capacity and efficiency of airspace
Risk Management	Risk factors: Inadequate funding; Inadequate staff; insufficient data
	Risk mitigation: identification of different funding sources; involvement of aircraft operators in the decision making; collect and store data: recruit and train staff
	7.
Risk Management	Risk factors: lack of funding; delay in aircraft equipage; Insufficient databases
	Risk mitigation: identification different funding sources; involvement of aircraft operators in the decision making;
Linkage to GPIs	GPI/1: Flexible use of airspace; GPI/5: performance-based navigation; GPI/6:Air traffic flow management :GPI/7: dynamic and flexible ATS route management; GPI/8:

	collaborative airspace design and management; GPI/9: situational awareness; GPI/10: Terminal area design and management; GPI/12: FMS-based arrival procedures;
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STRATEGIC OPERATIONAL IMPROVEMENT/ NATIONAL PERFORMANCE OBJECTIVE – 2	
IMPROVE RWY AND TERMINAL CAPACITY	
Performance Benefits	
Safety	1. Safety level improved
Environment	1. Reduced emissions through shorter runway occupancy time and taxi time
Capacity	1. Increased aerodrome capacity through better utilization of airside infrastructure

Cost effectiveness	1. Cost reduction through shorter ground movements			
Performance Measurement				
Metrics	1. Number of operations per hour			
	2. Arrival/departure delay i.e. minutes per flight			
	3. Amount of fuel burn per operations			
<i>Strategy</i> Medium term (2010 - 2015)				
ATM Operational Concept Components	Projects/Tasks	Timeframe Start/End	Responsibility	Status (as of ...)
AO, DCB, TS and CM	1.	August 2010 - October 2010	States /Territories	Database under preparation
	1.Improve surface movement and guidance control systems through SMGCS	Oct 2010-Feb2011	ANSP	Installation on-going
	2.Maximize runway capacity	Jan2011-Dec2015	KAA	Design stage

	in all weather operations			
	3.Implement ground control service	Jan2011- Dec2013	ANSP	Planning
	4.Separate departing passengers from arriving passengers	June2010- Dec2013	KAA	On-going
	5.Increase capacity for immigration and check-in	Jan2011- Dec2013	KAA	Planning
	8.Improve passenger utilities	Nov2010- Dec2015	KAA	On-going
	9.Enhance aerodrome ground lighting	July2011- July2013	KAA	Procurement stage
	10 Construct rapid exit taxiways and parallel runways	Jan2011- Dec2013	KAA	Design stage
	11.Improve signage	Jan2010- Dec2013	KAA	On-going
	4.Technology evaluation and GAP analysis			

Supporting tools	1.Safety case and safety analysis
	2.Business case and cost benefit analysis
	3.National workshops and seminars
ATM Community members	ANSP, Airspace provider-Kenya government, Airspace users, ATM support industry, Regulatory authorities , ICAO and Aerodrome operators
ATM Community expectations	1.Right of access to resources and equity for all users
	2.Capacity to meets peak demands,
	3.Cost effective aerodrome operations
	4.Minimize environmental impact
	5.Consistent and dependable levels of service
	6.Safety is highest priority
	7.Technical and operational interoperability and harmonization
Project Output	National performance plan for implementation of air navigation system elements that are operationally suitable, technically feasible and economically viable.
Project Outcome	Enhance capacity and efficiency of aerodrome operations.
Risk Management	Risk factors: lack of funding; insufficient data
	Risk mitigation: identification of different funding sources; involvement of aircraft operators in the decision making; access to commercial databases
Linkage to GPIs	GPI/5: performance-based navigation; GPI/9: situational awareness; GPI/9:Situational awareness;GPI/12:Functional

	integration of ground systems and airborne systems ;GPI/13: Aerodrome design and management; GPI/14: Runway operations; GPI/15: Matching IMC and VMC operating capacity
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**STRATEGIC OPERATIONAL IMPROVEMENT/
NATIONAL PERFORMANCE OBJECTIVE – 3**

MODERNIZE CNS/ATM FACILITIES

Performance Benefits

Safety	1. Safety level improved
Environment	1. Reduced emissions through adherence to preferred routing
Capacity	1. Increased aerodrome capacity through better utilization of CNS/ATM infrastructure
Cost effectiveness	1. Cost reduction through less maintenance expenses

Performance Measurement

Metrics	1. Number of operations per hour
	2. Arrival/departure delay i.e. minutes per flight
	3. Number of aircraft entering a specified volume of airspace/hr
	4. Amount of fuel burn per operations

<i>Strategy</i> Medium term (2010 - 2015)				
ATM Operational Concept Components	Projects/Tasks	Timeframe Start/End	Responsibility	Status (as of ...)
AO, DCB, TS and CM	1 Formulate airspace concept and determine near term operational improvements	August 2004 - October 2005	ANSP	COMPLETED
	2 Install DATIS at JKIA and Mombasa	July 2010- March 2011	ANSP	On-going
	3 Implement ADS-C and CPDLC	October 2010- March 2011	ANSP	Contract preparation
	8. Install Surface Movement	October 2010-	ANSP	On-going

	Radar	March 2011		
	9. Improve data and voice communications	January 2011-December 2012	ANSP	Planning
	10. Install ADS-B	2012-2015	ANSP	Planning
	11. Install Multiliteration Systems	2012-2015	ANSP	Planning
	12. Implement ATN	2013-2015	ANSP	Planning
	13. Implement SBAS	2013-2015	ANSP	Planning
Supporting tools	5. Technology evaluation and gap analysis			
	6. Safety case and safety analysis			
	7. Business case and cost benefit analysis			
	8. National workshops and seminars			
ATM Community members	Aerodrome operators ATM support industry, Regulatory authorities and ICAO			
ATM Community	9. Right of access to ATM resources and equity for all users			
	10. Capacity to meet peak demands, while minimizing restrictions			
	11. Cost effective air navigation services			

expectations	12. Minimize environmental impact
	13. Flexibility in adapting flight trajectories
	14. Technical and operational interoperability and harmonization
	15. Consistent and dependable levels of service
	16. Safety is highest priority
Project Output	National performance plan for implementation of air navigation system elements that are operationally suitable, technically feasible and economically viable.
Project Outcome	Enhanced capacity and efficiency of ATM operations.
Risk Management	Risk factors: Inadequate funding; delay in aircraft equipage; insufficient data
	Risk mitigation: identification of different funding sources; involvement of aircraft operators in the decision making; access to commercial databases
Linkage to GPIs	GPI/9: situational awareness; GPI/15: Matching IMC and VMC operating capacity; GPI/17: Data link applications; GPI/21: Navigation systems; and GPI/22: Communication infrastructure.

**STRATEGIC OPERATIONAL IMPROVEMENT/
NATIONAL PERFORMANCE OBJECTIVE – 4**

IMPROVE THE CONTENT, FORMAT AND TIMELINESS IN THE PROVISION OF MET SERVICES.				
Performance Benefits				
Safety	1. Safety level improved			
Environment				
Capacity	1. Increased traffic capacity through improved situation awareness			
Cost effectiveness	1. Cost reduction through improved flight planning.			
Performance Measurement				
Metrics	1. Number of operations per hour in low visibility conditions			
	2. Number of aircraft deviation due to weather			
	3. Number of runway excursions due to MET related reasons			
<i>Strategy</i> Medium term (2010 - 2015)				
ATM Operational Concept Components	Projects/Tasks	Timeframe Start/End	Responsibility	Status (as of Dec 2010)
AOM, AO, DCB, TS,	1. Install wind shear and	JAN 2011 – DEC 2013	KMD	Design stage

AUO, ATM SDM and CM	aerodrome weather warning systems			
	2.Implement the XML codes	JAN 2011 – JUN 2014	KMD	Planning stage
	3.Implement electronic MET provision for airspace users	JAN 2010 – DEC 2012	KMD	Design stage
	4.implement TCAC and WAFS	JAN 2011 – DEC 2015	KMD	Planning stage
	5.VAAC	JAN 2011 – DEC 2015	KMD	Planning stage
	6.Enhance situational awareness	JAN 2011 – DEC 2015	KMD	Implementation is On-going
	7.Implement meteorological down links at MET and ATS units	JAN 2011 – DEC 2015	KMD	Implementation is On-going

Supporting tools	1. Technology evaluation and gap analysis
	2. Safety case and safety analysis
	3. Business case and cost benefit analysis
	4. National workshops and seminars
ATM Community members	ANSP, Aerodrome operators, Airspace providers, Airspace users, ATM support industry, Regulatory authorities, and ICAO
ATM Community expectations	1. Right of access to authorised MET information rapidly.
	2. Capacity to meet peak demands and reduce delays
	3. Cost effective air navigation services
	4. Minimize environmental impact
	5. Flexibility in adapting flight trajectories
	6. Technical and operational interoperability and harmonization
	7. Consistent and dependable levels of service
	8. Safety remains the highest priority
Project Output	National performance plan for implementation of air navigation system elements that are operationally suitable, technically feasible and economically viable.
Project Outcome	Increase availability of MET information for the improvement in the provision of air navigation service.
Risk Management	Risk factors: lack of funding; insufficient data; inadequate MET equipage; lack of qualified staff.
	Risk mitigation: identification different funding sources; involvement of aircraft operators in the decision making; recruit, train and retain

	staff; access to Global MET databases; purchase required equipment.
Linkage to GPIs	GPI/7 Dynamic and flexible ATS route management; GPI/9: situational awareness; GPI/10 Terminal Area design and management; GPI/13: Aerodrome design and management; GPI/14: Runway operations; GPI/15: Matching IMC and VMC operating capacity; GPI/18: Aeronautical information; GPI/19: Meteorological systems.