

GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) WORKSHOP

THE GNSS APPLICATIONS IN AVIATION



*HELD AT PAMODZI HOTEL
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INTRODUCTION:THE GNSS APPLICATION IN AVIATION

- OBJECTIVE:TO GIVE AN OVERVIEW OF THE GNSS APPLICATIONS IN AVIATION WITHIN THE COMMUNICATIONS,NAVIGATION, SURVEILLANCE AND AIR TRAFFIC MANAGEMENT IMPLEMENTATION ON A WORLD WIDE BASIS, WITHIN AFRICA AND ZAMBIA'S SITUATION.

THE DISCUSSION FOCUS:

HISTORICAL BACKGROUND
THE AIR NAVIGATION SYSTEM OF CNS/ATM
THE CURRENT NAVIGATION SYSTEM AND ITS COMPOSITION
CONSTRAINTS
THE NEW GNSS SYSTEM AND ITS COMPOSITION
ITS BENEFITS
THE CURRENT CHALLENGES ON LEVEL OF GNSS APPLICATION
ZAMBIA'S SITUATION
WAYFORWARD
FUTURE OUTLOK



HISTORICAL BACKGROUND

- IT IS NOT AS A RESULT OF A BIG BANG THEORY;
- AIR TRANSPORT ACTIVITIES ARE COORDINATED GLOBALLY THROUGH THE INTERNATIONAL CIVIL AVIATION ORGANISATION(ICAO) THAT CAME INTO BEING AFTER THE SIGNING OF THE CHICAGO CONVENTION ON 7TH DECEMBER 1944 AND IS A UNITED NATIONS SPECIALISED AGENCY ON CIVIL AVIATION MATTERS;
- IT CAME INTO BEING AS A RESULT OF THE AIR TRANSPORT INDUSTRY GROWTH OF THE 1980,1990 THAT WAS REACHING PEAK CAPACITY;
- THE CURRENT SYSTEM FAILURE TO MEET FUTURE NEEDS;
- A CALL BY THE INTERNATIONAL CIVIL AVIATION ORGANISATION FOR A STUDY TO ADDRESS THE ISSUE OF FUTURE REQUIREMENTS;
- A STUDY OF FUTURE AIR NAVIGATION SYSTEMS WAS FORMED (FANS-1) IN1983, AND COMPLETED IN1988;
- THIS CULMINATED INTO A CNS/ATM SYSTEM WHOSE EMPHASIS WAS ON SATELLITE AND OTHER NEW TECHNOLOGIES AFTER 1991 TENTH AIR NAVIGATION CONFERENCE IN MONTREAL, CANADA UNDER THE INTERNATIONAL CIVIL AVIATION ORGANISATION;
- FOLLOWING THE TENTH AIR NAVIGATION CONFERENCE OF SEPTEMBER 1991 CALLED BY ICAO, THE CNS/ATM GLOBAL CONCEPT IMPLEMENTATION WAS ADOPTED AND REGIONS WERE TO DEVELOP REGIONAL APPROACHES AND NATIONS DEVELOP THEIR NATIONAL APPROACH;
- THIS HAS SINCE RESULTED INTO THE REVISION OF THE STANDARDS AND RECOMMENDED PRACTICES IN THE ASSOCIATED ANNEXES TO AIR NAVIGATION TO TAKE INTO ACCOUNT THE NEW TECHNOLOGY;
- ICAO AS WELL AS OTHER INTERNATIONAL USER GROUPS HAVE ACCEPTED GPS AND GLONASS AS THE CORE FOR AN INTERNATIONAL CIVIL SATELLITE NAVIGATION SYSTEM

AIR NAVIGATION SYSTEM

- DEFINITION:
- COMMUNICATION, NAVIGATION AND SURVEILLANCE SYSTEMS EMPLOYING DIGITAL TECHNOLOGIES, INCLUDING SATELLITE SYSTEMS TOGETHER WITH VARIOUS LEVELS OF AUTOMATION, APPLIED IN SUPPORT OF A SEAMLESS GLOBAL AIR TRAFFIC MANAGEMENT.

ELEMENTS OF AIR NAVIGATION SYSTEM

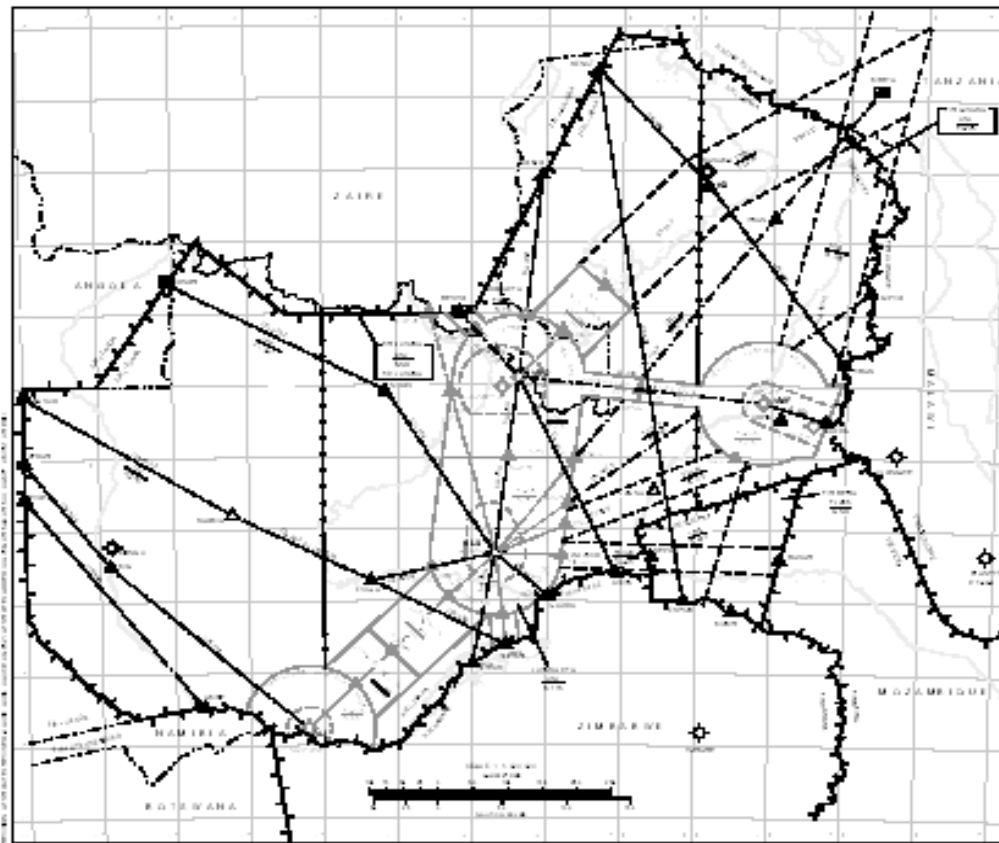
- AIR NAVIGATION SERVICES:
- AIR TRAFFIC SERVICES
- AERONAUTICAL TELECOMMUNICATIONS.

ANS CONTD

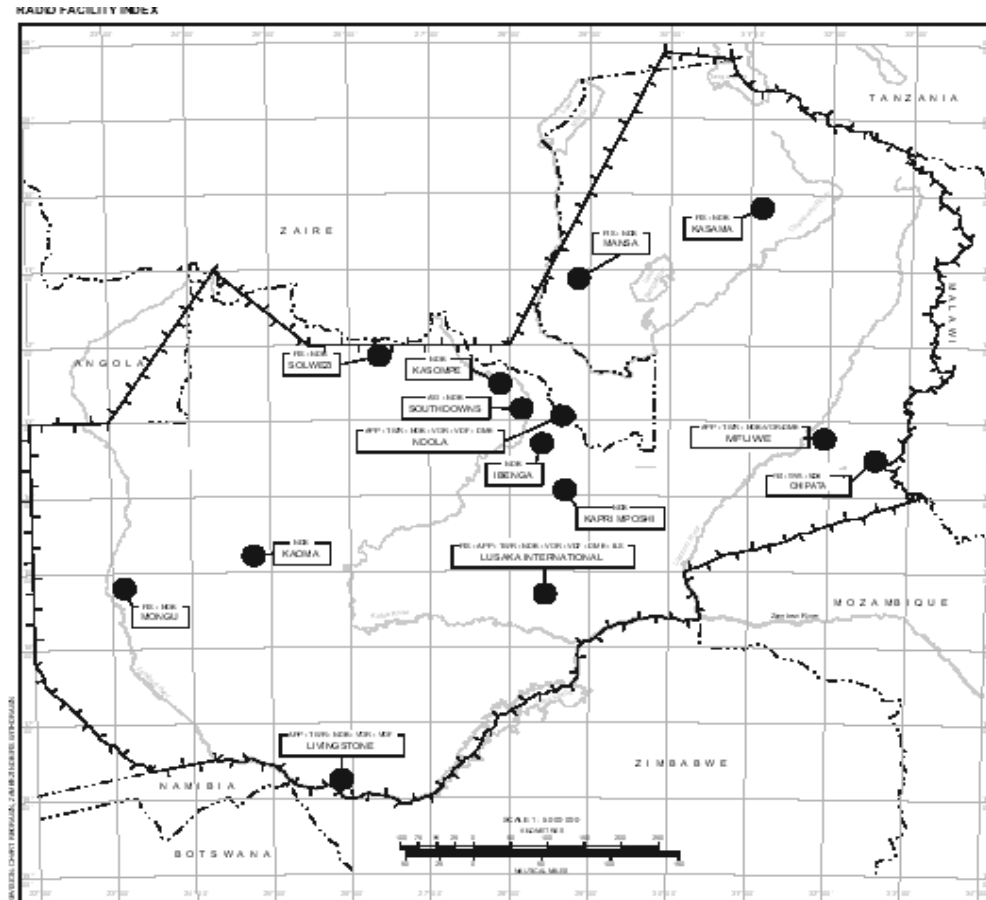
- AIR TRAFFIC SERVICES;
- AIR TRAFFIC CONTROL
- FLIGHT INFORMATION SERVICES
- ALERTING SERVICES

- AERONAUTICAL TELECOMMUNICATIONS;
- COMMUNICATION SYSTEMS
- NAVIGATION SYSTEMS
- SURVEILLANCE SYSTEMS
- AUTOMATED SYSTEMS

Air Traffic Services in Zambia



Air Traffic Services in Zambia



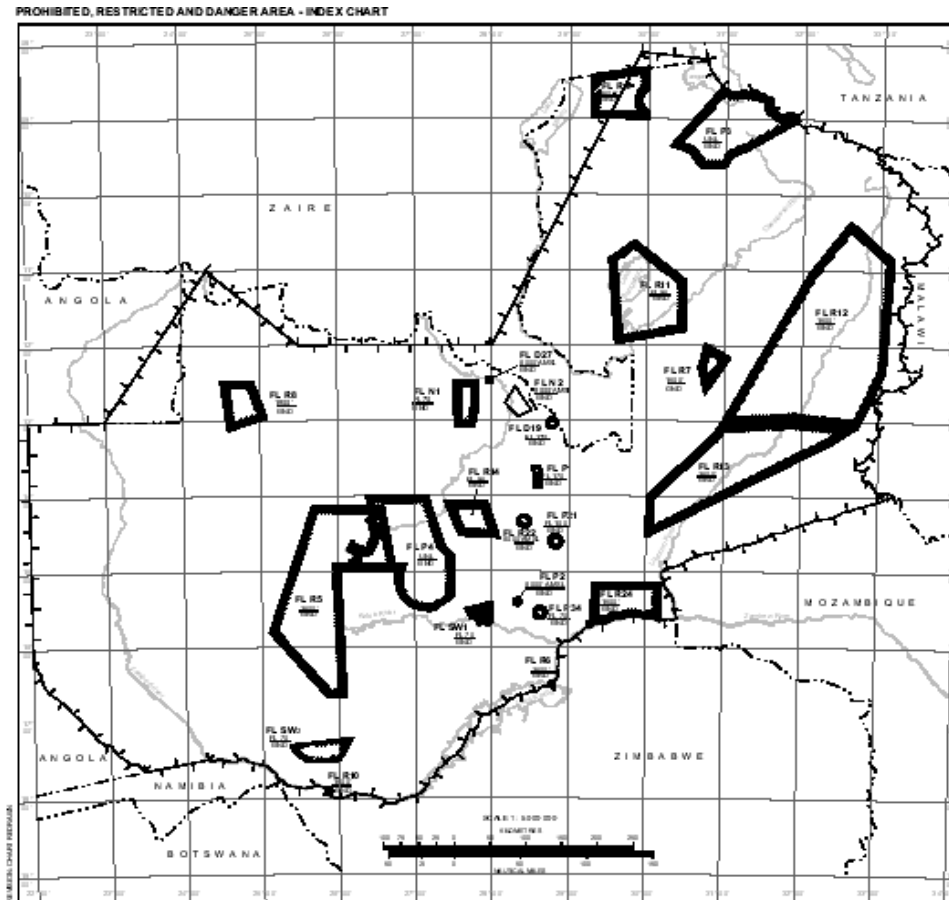
ANS CONTD

- **ATS MAY BE PROVIDED IN UPPER, INTERMEDIATE AND LOWER LEVELS OF AIRSPACE AND AERONAUTICAL MOBILE SERVICES COMMUNICATIONS ARE ACCORDINGLY ENGINEERED TO SUIT THE NEEDS.**
- **ANS ARE PROVIDED WITHIN A DEFINED FLIGHT INFORMATION REGIONS.**
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AIRSPACE CONTD

- AIRSPACE-ICAO SIGNATORIES ARE USUALLY RESPONSIBLE FOR PROVISION OF AERONAUTICAL SERVICES IN THEIR SOVEREIGN AIRSPACE(AND MAY BE IN CERTAIN AIRSPACE ADMINISTERED OVER THE HIGH SEAS IF RELEVANT.)
- FIR DEFINITION-IS AN AIRSPACE OF DETERMINED DIMENSIONS AS DEPICTED WITHIN WHICH FLIGHT INFORMATION AND SEARCH AND RESCUE, ALERTING SERVICES IS PROVIDED THIS MAY INCLUDE DELEGATED AIRSPACE.

Classified Areas in Zambia



ANS CONTD

- **MISSION OF IMPLEMENTATION-**

- TO DEVELOP A SEAMLESS, GLOBALLY COORDINATED SYSTEM OF AIR NAVIGATION SERVICES THAT WILL COPE WITH WORLD WIDE GROWTH IN AIR TRAFFIC DEMAND WHILE:
 - IMPROVING UPON THE PRESENT LEVELS OF SAFETY
 - IMPROVING UPON THE PRESENT LEVELS OF REGULARITY
 - IMPROVING UPON THE OVERALL EFFICIENCY AND CAPACITY OF AIRSPACE AND AIRPORTS
 - IMPROVING OPERATIONS ALLOWING FOR CAPACITY INCREASE WHILE MINIMISING FUEL CONSUMPTION AND AIRCRAFT ENGINE EMISSIONS
 - INCREASING THE AVAILABILITY OF USER-PREFERRED FLIGHT SCHEDULES AND PROFILES
 - MINIMISING DIFFERING EQUIPMENT CARRIAGE REQUIREMENTS BETWEEN REGIONS.

CONSTRAINTS

PROPAGATION LIMITATIONS OF CURRENT LINE OF SIGHT SYSTEMS

THE DIFFICULTY, CAUSED BY A VARIETY OF REASONS TO IMPLEMENT CURRENT CNS SYSTEMS AND OPERATE THEM IN A CONSISTENT MANNER IN LARGE PARTS OF THE WORLD

THE LIMITATIONS OF VOICE COMMUNICATION AND LACK OF DIGITAL AIR-GROUND DATA INTERCHANGE SYSTEMS TO SUPPORT AUTOMATED SYSTEMS IN THE AIR AND ON THE GROUND



THE NEW GNSS SUBSYSTEMS

- IS GOVERNED BY THE UNIVERSAL ACCESSIBILITY PRINCIPLES.
- SOVEREIGNTY AND AUTHORITY AND RESPONSIBILITY OF OPERATING STATE IS MAINTAINED.
- INSTITUTIONAL ARRANGEMENTS AND IMPLEMENTATION AT A GLOBAL LEVEL.
- IMPLEMENTATION IS IN AN EVOLUTIONARY PROGRESSION FROM EXISTING TO GPS ,GLONASS AND GALILEO ETC .
- CONTINUITY AND QUALITY OF SERVICE TO BE MAINTAINED AND EVEN BETTER.
- COST RECOVERY CONSIDERATIONS TO BE TAKEN INTO ACCOUNT.

THE BENEFITS OF THE NEW GNSS SYSTEMS

- AIRLINES:

- ENHANCED SAFETY,
 - REDUCED DELAYS,
 - REDUCED FLIGHT OPERATING COSTS,
 - REDUCED FUEL CONSUMPTION AND EMISSIONS AND
 - MORE EFFICIENT USE OF THE AIRSPACE; MORE FLEXIBILITY;
 - REDUCED SEPARATIONS

BENEFITS CONTD

- STATES:

- A REDUCTION IN THE OVERALL COST OF OPERATION AND MAINTENANCE OF FACILITIES IS EXPECTED AS THE TRADITIONAL GROUND BASED SYSTEMS BECOME OBSOLETE AND SATELLITE TECHNOLOGY IS INCREASINGLY EMPLOYED

BENEFITS CONTD

- **ENVIRONMENT:**

- AS AVIATION INDUSTRY GROWS MORE AND MORE RAPIDLY, THE IMPACT OF AIR TRAFFIC OPERATIONS ON THE ATMOSPHERE BECOMES MORE IMPORTANT IN ADDITIONAL TO THE LOCAL EFFECTS OF NOISE AND AIR QUALITY IMPROVEMENTS DUE TO REDUCTION IN FUEL BURN AND REDUCED LEVELS OF AIRCRAFT ENGINE EMISSIONS.

BENEFITS CONTD

- **GENERAL AVIATION:**

- GENERAL AVIATION AND UTILITY AIRCRAFT WILL FIND INCREASING ACCESS TO AVIONICS EQUIPMENT THAT WILL ALLOW THEM TO OPERATE IN FLIGHT CONDITIONS INTO AND OUT OF AIRPORTS THAT THEY WOULD NORMALLY HAVE BEEN PROHIBITED FROM USING BECAUSE OF OPERATION COSTS AND ASSOCIATED REQUIREMENTS.
- MANY MORE REMOTE AREAS THAT ARE CURRENTLY INACCESSIBLE TO MOST GENERAL AVIATION AIRCRAFT BECAUSE OF THEIR INABILITY TO COMMUNICATE OR SAFELY NAVIGATE OVER THEM WOULD BECOME ACCESSIBLE.

BENEFITS CONTD

● **INDIRECT BENEFITS:**

- LOWER FARES AND RATES
- PASSENGER TIME SAVING
- TECHNOLOGY ENSURES THAT AIRCRAFT CAN OPERATE UNDER ALL TYPES OF WEATHER CONDITIONS
- MINIMISE DIFFERING EQUIPMENT CARRIAGE REQUIREMENTS BETWEEN REGIONS
- ENHANCED TRADE OPPORTUNITIES AND INCREASED EMPLOYMENT

THE CURRENT CHALLENGES ON LEVEL OF GNSS APPLICATION

- LIMITED INFRASTRUCTURE TO SUPPORT THE APPLICATIONS OF GNSS TECHNOLOGIES
- LACK OF CLEAR LEGAL FRAME WORK GUIDING THE APPLICATION OF GNSS TECHNOLOGY
- LACK OF FINANCIAL RESOURCES TO INVEST IN GNSS TECHNOLOGY
- LACK OF AWARENESS ON THE PART OF DECISION AND POLICY MAKERS
- LACK OF STANDARDISATION ON CURRENT EQUIPMENT
- LACK OF TRAINED MANPOWER

ZAMBIA'S SITUATION

- ZAMBIA HAS A NATIONAL CNS/ATM IMPLEMENTATION COMMITTEE IN PLACE AND ITS INTER-MINISTERIAL IN COMPOSITION.
- IS AN ACTIVE MEMBER OF THE INTERNATIONAL CIVIL AVIATION ORGANISATION REGIONAL PLANNING AND IMPLEMENTATION GROUP. THE AFRICAN INDIAN OCEAN REGIONAL PLANNING AND IMPLEMENTATION GROUP (AFI APIRG)
- IS ALSO ACTIVE MEMBER OF BOTH COMESA AND SADC CNS/ATM GROUPINGS.
- WE HAVE BEEN HOST OF THE EGNOS(TEST BED) FOR THE PURPOSES OF COLLECTING DATA ON THE EGNOS SIGNALS FOR THE PURPOSES OF AUGUMENTATION WITH GPS AND GLONASS.
- IN THE PROCESS OF COVERING THE COUNTRY ON THE UPPER VHF GROUND TO AIR COMMUNICATION WHICH LATER WOULD BE LINKED TO THE SURVEILLANCE UNDER AUTOMATIC DEPENDANCE SURVEILLANCE-BROADCAST (ADS-B) .
- WE ARE IN NEED OF FINANCIAL ASSISTANCE TO IMPLEMENT OUR REQUIREMENTS
- WE DID A FEASIBLY STUDY ON THE CNS/ATM IMPLEMENTATION IN THE COUNTRY IN SEPTEMBER 2001
- WE HAVE PREPARED FOR REDUCED VERTICAL SEPARATION MINIMA IMPLEMENTATION FOR UPPER AIRSPACE TRAFFIC.
- WE ARE READY TO COOPERATE TO ACHIEVE THE NUMEROUS BENEFITS OFFERED ON A WIN –WIN SITUATION .
- GNSS ARRIVAL AND DEPARTURE PROCEDURES DONE FOR LUSAKA AND LIVINGSTONE INTERNATIONAL AIRPORTS AND ARE ON TRIAL

WAYFORWARD

- LEGAL: THERE IS NEED FOR THE GNSS LEGAL FRAMEWORK TO BE TACKLED/ CONSIDERED BEFORE IMPLEMENTATION
- FINANCE: COST RECOVERY, COST BENEFIT ANALYSIS FINANCING ARRANGMENTS NEED TO BE CONSIDERED AND WORKED OUT BEFORE IMPLEMENTATION
- TECHNICAL COOPERATION: AVAILABLE AT REGIONAL LEVEL FOR IMPLEMENTATION PURPOSES.
- HUMAN RESOURCE: TRAINING OF PERSONNEL AND SHARING OF EXPERIENCES BE ACCELERATED
- ORGANISATIONAL AND INSTITUTIONAL COOPERATIVE ASPECTS : NEED HARMONIZATION
- ENVIRONMENTAL BENEFITS: NEED TO BE TAKEN INTO CONSIDERATION

FUTURE OUTLOOK

THE FUTURE IS BRIGHT FOR GNSS IMPLEMENTATION .

1)THE TECHNOLOGY IS MATURE.

2)COMMUNICATION NAVIGATION AND SURVEILLANCE ARE ACCURATE AND FAST AND IN REAL TIME.

3) THE WORLD HAS BECOME A GLOBAL VILLAGE – AS BARRIERS OF BOUNDARIES AND TIME ARE BEING BROKEN.

THE TECHNOLOGY CAN HELP CONTAIN THE INCREASED DEMAND IN TRAVEL CAPACITY WITHOUT COMPROMISING SAFETY REQUIREMENTS

THE TECHNOLOGY HAS AN IMPACT ON CLEANER ENVIRONMENT REQUIREMENTS BECAUSE OF DIRECT ROUTES RESULTING IN REDUCED TIME AND LESS FUEL BURN



FINAL APPEAL

YOU HAVE AN OPPORTUNITY TO WRITE HISTORY AND MOVE THE
WORLD A STEP FURTHER AS YOU ARE THE DECISION MAKERS.
MAKE THAT RIGHT DECISION TO SEE THE IMPLEMENTATION AND USE
OF GNSS TECHNOLOGY;

OVERCOME THE LEGAL, FINANCIAL AND TECHNICAL BARRIERS TO
ACHIEVE THE ABOVE.

I'M SURE DISTINGUISHED LEADERS YOU CAN DO IT, MAY IT REMAIN
DONE , AND MAY I THANK YOU FOR THE DECISION YOU WILL MAKE.

THANK YOU FOR LISTENING

SAFE PASSAGE BACK AND ENJOY YOUR STAY IN ZAMBIA

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