AIR TRAFFIC MANAGEMENT

AIR TRAFFIC CONTROL AUTOMATION SYSTEM

Supplying ATM systems around the world for more than 30 years

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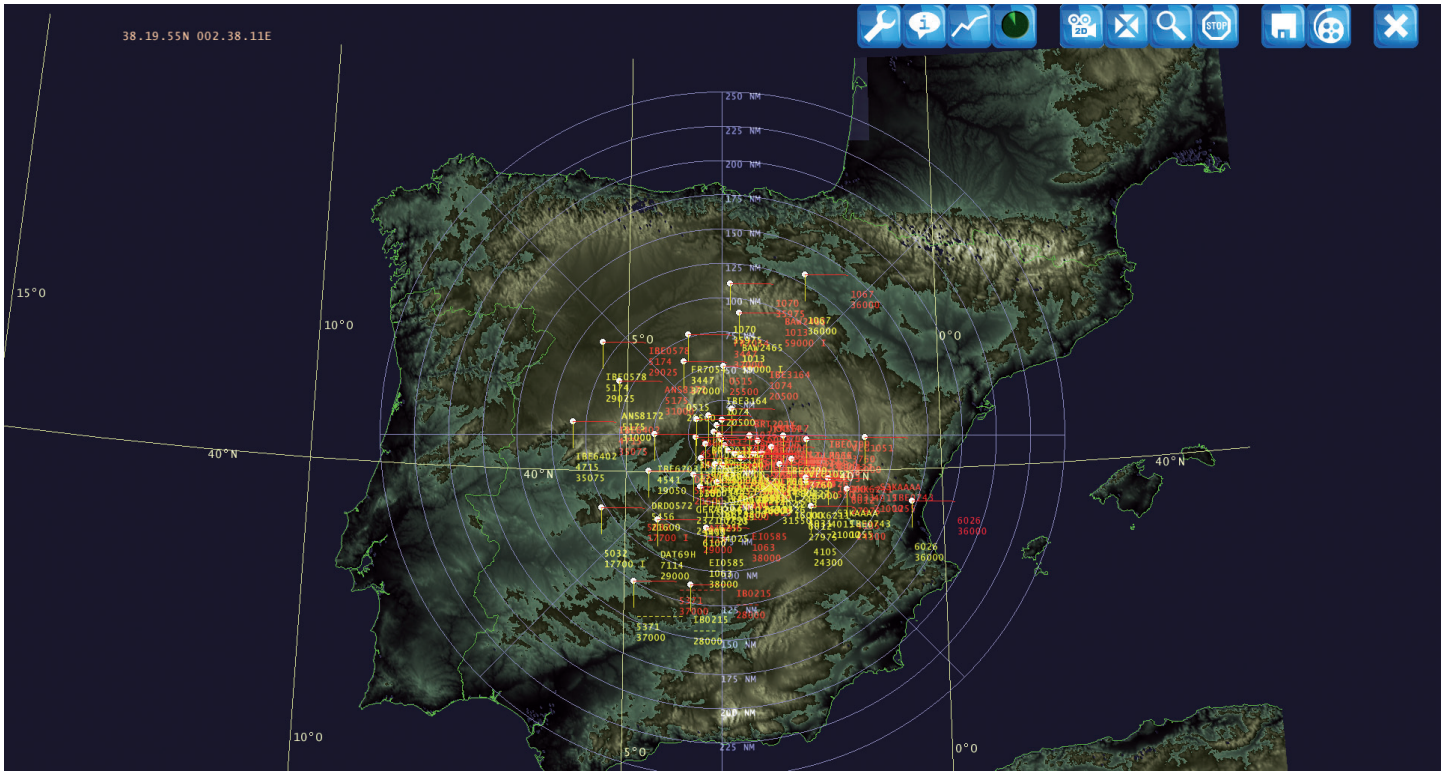


Provides controles with the whole information about air movements

Introduction

The AirCon 2100 offers one of the most advanced automated air traffic control systems which meets International Civil Aviation Organization (ICAO) standards and recommended practices in air traffic management.

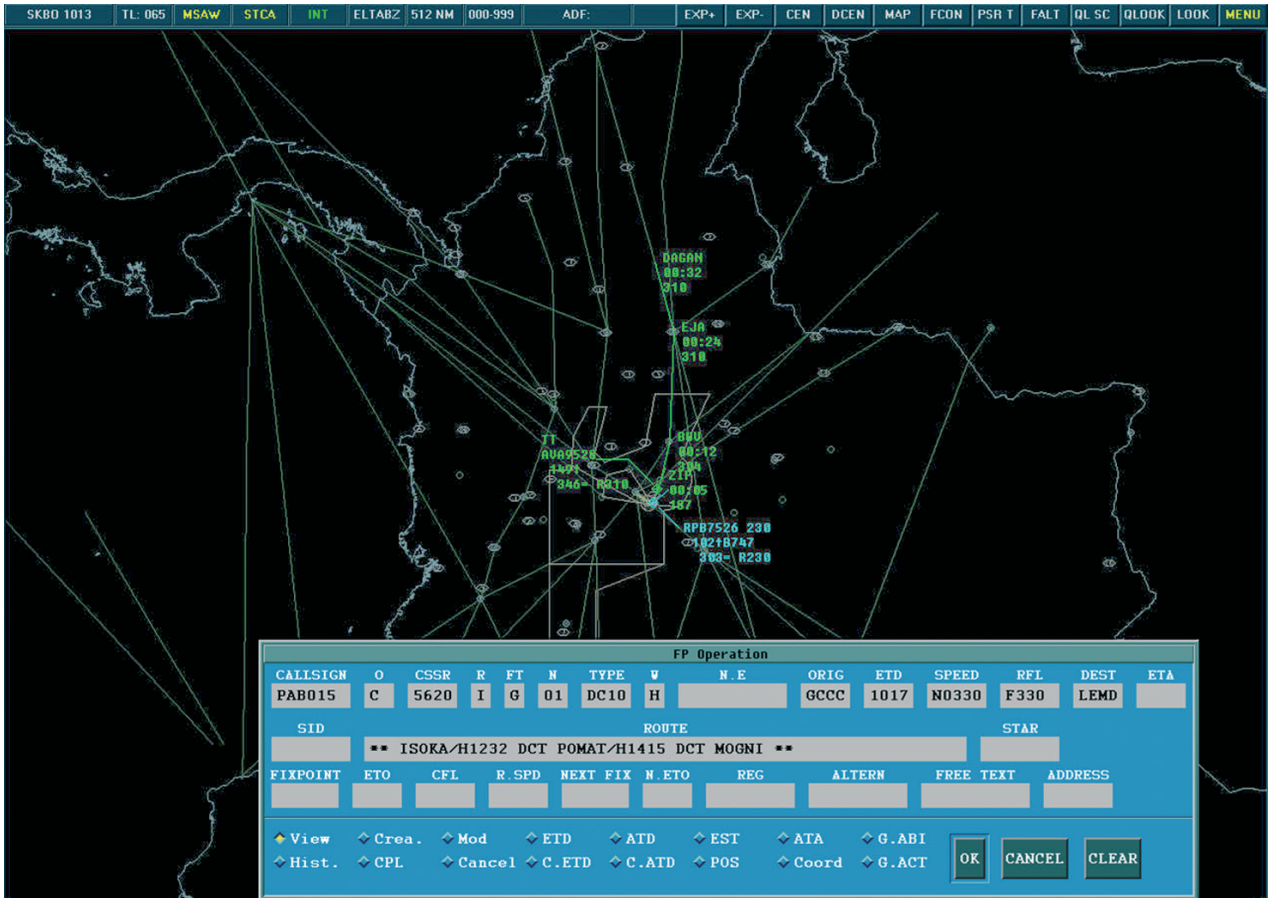
The strong requirements concerning air traffic safety and high reliability of the equipment are met by the AirCon 2100 by the innovative use of the state-of -the-art technology.

Being the safety and reliability the cornerstone of the AirCon 2100, the Indra's recognized expertise in ATC systems has served to make the AirCon 2100 a system friendly to use and easy to maintain. It represents the best tradeoff for ATM systems ranging from highly competitive COTS solution to full performance semi custom systems.

The mission of the AirCon 2100 is to enhance the safety of the flights by providing the controllers with information of air movements from radars, flight plans, direction finders and air-ground data-link messages (ADS/CPDLC). It also provides a high degree of automation of the control tasks, with flight plan management tools, automatic flight tracking system, automatic coordination between control position and control centers, safety nets, medium term traffic prediction tools...

The system covers en route control, approach control, TWR applications, as combined en route and approach control solutions.

The AirCon 2100 comprises all the necessary elements and equipment to carry out the ATC services.



Situation Data Display (SDD)

System overview

State-of-the-art technology for ATM

The AirCon 2100 incorporates the most advanced techniques for ATM:

- Open system LAN-based architecture
- Commercial RISC processors
- UNIX operating system
- Standard communication protocols (IEEE-802.3, TCP/IP, UDP/IP)
- Color raster displays :
  - Rectangular screen up to 29 inches diagonal
  - High resolution: 1600 x 1280 and 2Kx2K pixels
  - Standard graphics : X-Window, MOTIF
- Advanced software languages (ADA, C++), commercial databases (Postgre) and standard database access languages (4GL, SQL)

Full availability and back-up features are provided by the use of:

- Dual redundant servers
- Dual redundant LAN (Local Area Network)
- Distributed Radar Processing located at the working positions
- Proven high-performance hardware
- Proven software algorithms, with self-recovery procedures

This results on a system availability > 0.9999

Characteristics/benefits

Based on a legacy of successfully delivered systems around the world	• Proven system stability and performance • Reduces technical and schedule risks
Open system architecture by complying with open system standards (UNIX, Ethernet...)	• Avoids premature technological obsolescence • Ensures support longevity at reasonable cost • Provides cost effective growth path • Easy integration of Customer Furnished Equipment
Use of COTS technology from industry leaders	• Avoids the need for hardware or software development • Simplifies maintenance and support activities
Scalable design that allow future growth	• Streamlines system upgrade to satisfy future workload demands
All mission critical servers are redundant with proven switchover strategy	• Provides a highly reliable system • Reduces system downtime by providing redundancy • Simplifies maintenance
Modular SW and HW design	• Simplifies maintenance and logistics activities • Streamlines controller and maintenance training
Designed to allow evolutionary upgrades and future enhancements	• Permits midlife technology insertion without redesign • New functionality can be added cost effectively • Reduces the final cost of the overall system life cycle

System components

Flight Data Processing (FDP)

- Reception and processing of AFTN/ADEXP messages
- Validation and processing of flight plans entered from the AFTN/IFPS or controller WP
- Management of flight plan (FPL) database and support of operator's actions
- Analysis of flight plan routes and calculation of flight trajectory and estimated times
- Assignment of SSR codes (domestic flights), SID and STAR procedures
- Distribution of flight plans to the SDP, controller workstation, strip printers and adjacent ACCs
- Handoff management
- Inter-centers coordination (OLDI, AIDC)
- Issue and transmission of AFTN messages
- Update of flight plan estimates provided by the surveillance data processing
- Detection of potential conflicts in standard separations of FP: Medium Term Conflict Detection Alert (MTCD)
- Monitoring aids (route conformance, SSR duplicated)
- Forecasting of potential intrusion into restricted areas.
- Flow planning
- Meteorological and aeronautical information management (MET)
- Recording of flight plans for further use in billing calculation and statistics
- Validation and processing of NOTAMs entered from the AFTN or from selected workstations
- Airspace management (AUP/UUP maintenance and static, pre-tactical and tactical restricted areas management)
- Management of flow restrictions and slots, with processing of TACT messages
- Identification of flight plans as RVSM equipped flight
- Identification of flight plans as 8,33 equipped flight
- PIP navigation window to display pictures, maps... between working positions (via Intranet)

Surveillance Data Processing (SDP)

- Radar data input processing and real-time quality control
- Monoradar and multiradar tracking and fusion
- Distribution of system tracks to external users
- Weather data processing
- ADS data processing and tracking (ADS-B and ADS-C)
- Flight plan functions (FP-track association, FP tracking, flight handoff, synthetic tracks)
- Redundancy and fall back

Safety nets

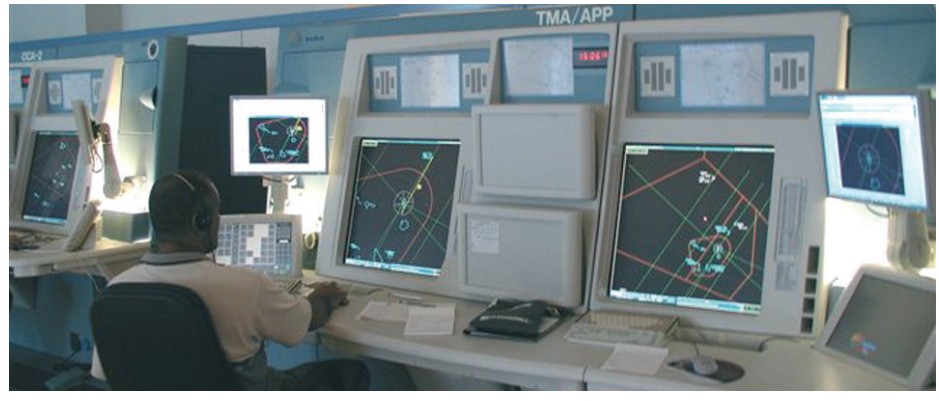
- Short Term Conflict Alert (STCA), prediction and violation of separation between aircraft in standard and RVSM (Reduced Vertical Separation Minimun) airspaces
- Minimum Safe Altitude Warning (MSAW), prediction and violation of altitude separation between aircraft and terrain
- Area Proximity Warning (APW), prediction and violation of incursion between aircraft and active protected area

Radar Data Compressor Unit-RDCU

- Communication front-end with different external radars and systems. RDCU can be dimensioned (modules, I/F channels) to meet customer needs in terms of number of radars and external users
- Support for all the functionality of conversion and distribution of radar messages for internal and external systems
- Validation of radar messages in each of the radar native formats
- Conversion of any external to ASTERIX common internal format
- Distribution of messages to internal and external users over TCP/IP, HDLC and X25 protocols
- Independently configuration of filtering policies for every user
- Recording of all incoming data 24/7
- Generation of informs and statistics
- Scalable for any need of reception and distribution of radar data

Data Link Server - DLS

- Interface to the air segment for all Air Ground Data Link (AGDL) services regarding ADS/CPDLC messages
- Organization of the data link message exchange between AirCon 2100 subsystems and the network (ATN, SITA, and ARINC)
- Assignment of messages to the appropriate SDD, the SDP or the FDP
- Monitoring of the status of the data link connection to each flight and the operational procedures concerning specific flights
- Management of the communication with the external world, storing aircraft addresses, and conversion and formatting of messages



Indra control working position

System components

Situation and Flight Data Displays (SDD/FDD)

- Display of system tracks (radar/ADS), radar plots, ADS reports, DF and weather contours
- Display of flight plan, coast and hold lists
- Display and graphic modification of flight plan route
- Display of aeronautical maps and restricted areas
- Graphic tools (RBLs and local maps)
- Display of auxiliary information (time, QNH, controlled sectors, sector assignations...)
- Display of MET information
- Access to flight plan database (retrieve, creation, modification and cancellation)
- Support of controllers actions (clearances, ATD, ARR and EST)
- Save/Restore of user preferences
- Control features of the local display (filters, off centering and range)
- Printout of flight strips (for non strip-less environments)
- Display of Short Term Conflict Alerts (STCA), Minimum Safe Altitude Warnings (MSAW), Area Proximity Warning (APW), CFL Conformance Alarms (CLAM), and Route Adherence Monitoring (RAM)
- Display of conflict situations (MTCD) and traffic extrapolated to the future
- Inter-console marker
- Track location by SSR code input
- Autonomous monoradar tracking in case of failure of the SDP servers (by-pass mode)
- Local recording and playback of the last 24 hours traffic (tracks, flight plans and display status)
- Playback of recorded data (playback mode)
- Correction/display/printing of AFTN messages
- Access to RPL, preliminary plan and SFPL database
- Access to MET/AIS databases
- Display of AIP documents
- Transmission of AFTN messages to external centers
- Display of traffic lists (flow planning)
- Management of flow restrictions and slots
- Management of NOTAMs

Data Recording Facility (DRF)

- Recording of radar, FP and ADF data as well as CWP status of all SDDs
- Save of the recorded data in local disk and DDS tapes
- Playback in any non-sectorized SDD
- Voice and data synchronization for playback
- Last 24 hours data recorded in the local SDD disk, available for immediate playback

Control & Monitoring Display (CMD)

- Graphical display of the system layout, including external systems
- Display of system messages
- Listing of logged users
- System messages logged to printer and recorded on disk
- Complemented with a SDD configured to monitoring the raw plots and tracks received from the different radar sites
- Establishment of sector assignment
- Provision of configuration data to the Voice Communication System (VCS) upon sector reconfiguration such that the VCS and ATM system may be reconfigured in one action
- Radar configuration and radar statistics (RTQC of radar data)
- System statistics
- Configuration of system functions
- Change of VSP parameters
- System partial/global shutdowns/startups
- Equipment switchovers

Data Base Management (DBM)

- Definition of the database with data adapted to the peculiarities of the ACC
- Setting of radar parameters (elevation, scan period, coverage, noise, radar format...)
- Definition of airways, SID & STAR procedures
- Configuration of airports with its runways
- Navigation aids
- AFTN and OLDI addresses
- Sectors
- Adjacent centers
- Minimum altitude zones
- Aircraft performances
- Automatic generation of SDD maps
- Based on commercial databases and standard query languages (SQL, 4GL)

Simulation Subsystem (SIM)

Simulation subsystem can be scaled from a full autonomous system (including capabilities for being a complete ATM backup system) to a software mockup for main-system support. It provides capabilities to training controllers in an environment replicated from the operational system, software test bed of the operational system, and operational system backup. To achieve this goal the simulation subsystem includes different controller positions, pilot and supervisor positions as well as a set of tools for the creation and evaluation of the training exercises, configurable for every application.

ISO 9001:2000

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Indra reserves the right to modify these specifications without prior notice.

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