



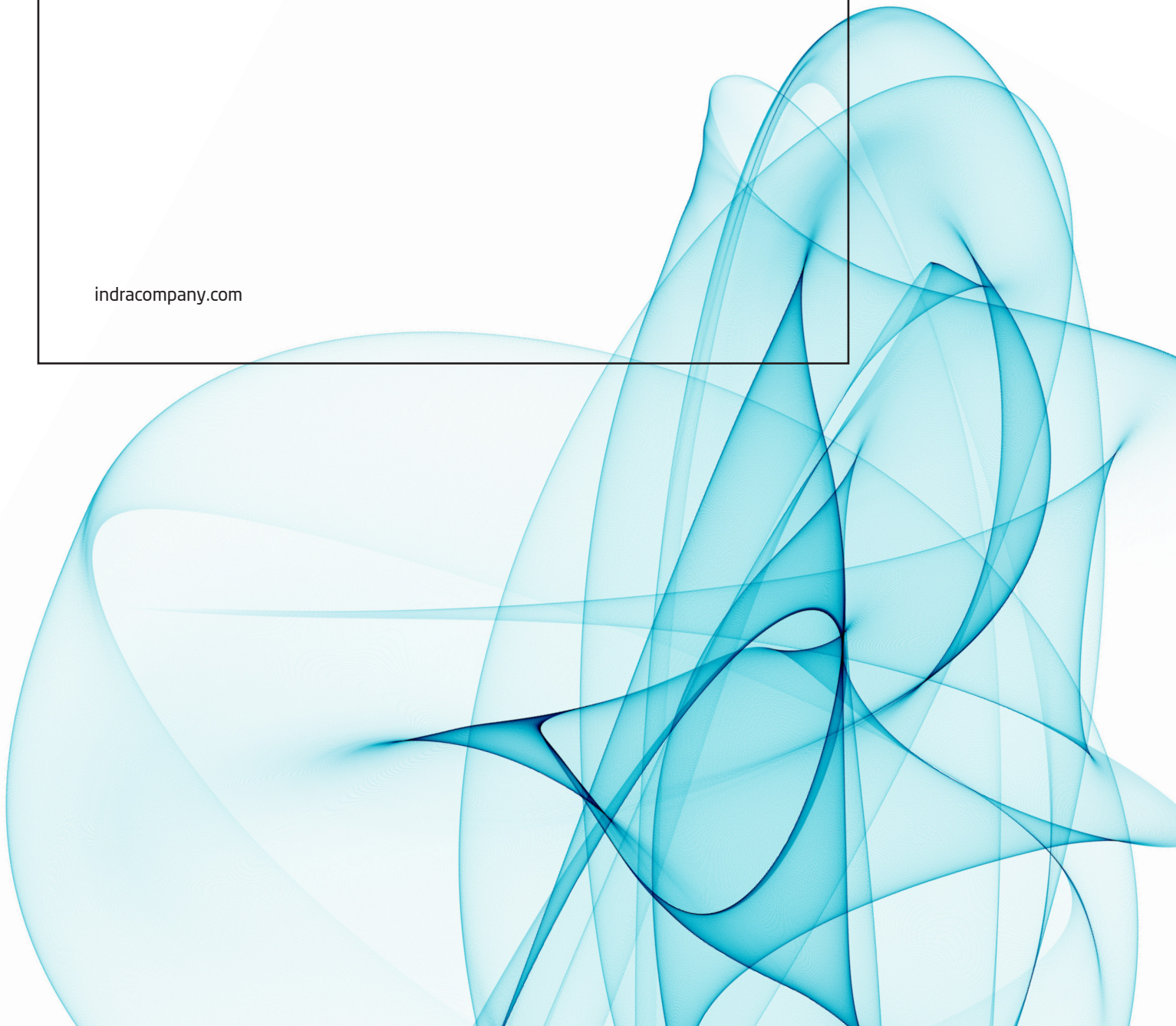
indra

AIR TRAFFIC MANAGEMENT

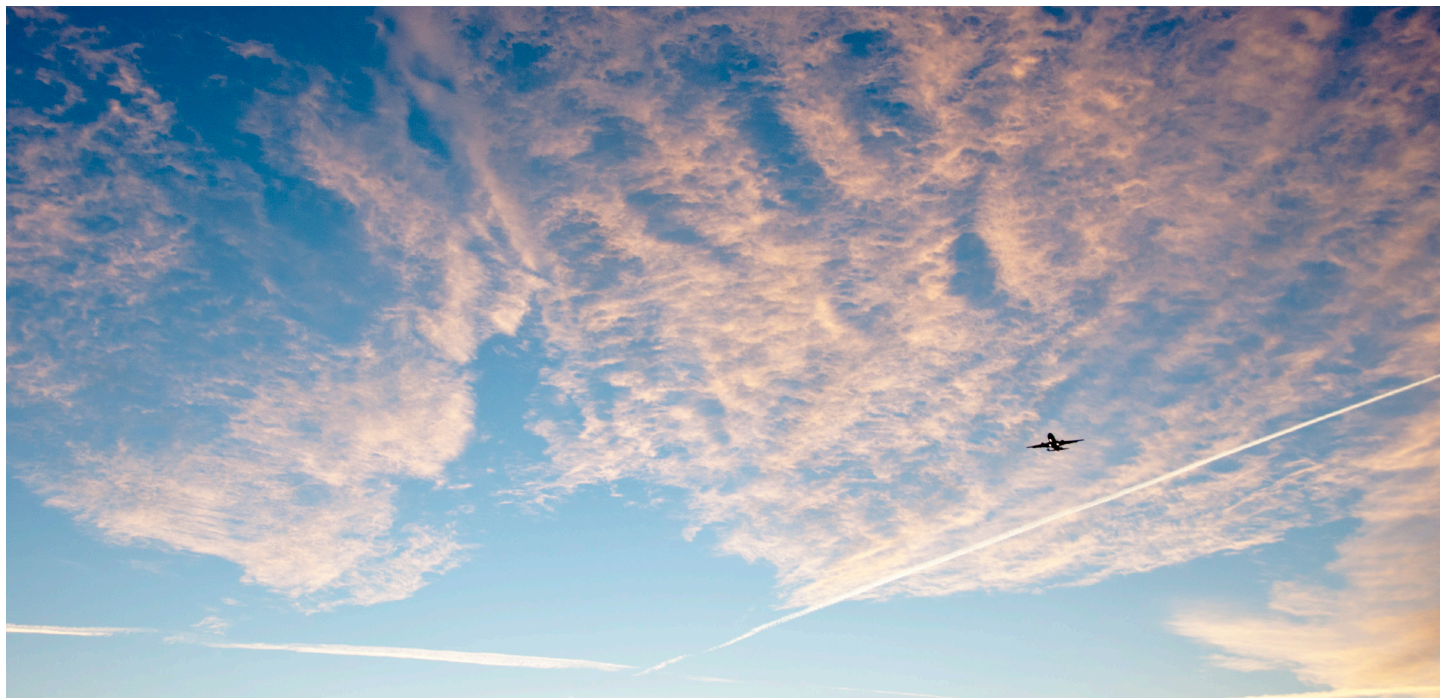
AIR TRAFFIC MANAGEMENT

Supplying ATM systems around the world for already 100 years

indracompany.com



AIR TRAFFIC MANAGEMENT



Performance-Driven Excellence in Project Management at the service of the customer

Indra Air Traffic Management experience

Indra is a leading company in the international market in Air Traffic Management and Control Systems. Indra has been supplying Air Traffic Management systems around the world for already 100 years, having supplied over 4000 Air Traffic Management installations in over 160 countries.

Particularly, Indra is recognised as a world ATM leader having supplied installation worldwide and being trusted to manage the most busiest and complex airspaces as for example in Europe.

In December 2008, Indra supplied Eurocontrol with the new next-generation interoperable Flight Data Processing System at Maastricht Upper Area Control Centre.

The implementation of this FDPS is a technological breakthrough aimed at improving the safety, capacity, efficiency and environmental performance of Air Traffic management in Europe, while actively contributing to achieve the European's Commission Single European Sky objectives.

Additionally Indra has been selected by the most advanced European Air Navigation Service Providers to develop the future Air Traffic Management systems following the Single Sky Concept, through the iTEC Program (Interoperability Through European Collaboration), which is currently composed of ENAIRE (Spain), DFS (Germany), NATS (United Kingdom), LVNL (Netherlands), AVINOR (Norway), Oro Navigacija (Lithuania) and PANSA (Poland) with Indra as industrial partner.

With the aim to provide our Customers with comprehensive, full and turnkey solutions, Indra product range covers the whole range of Air Traffic Management Systems, including Surveillance, Automation, Communications, Simulators and NavAids.

Indra has the extensive experience and technological know-how necessary to successfully carry out any Air Traffic Management program, with both a proven international management approach and a history of responsible program execution.

This experience, together with a solid technology base, permanent innovation and quality in processes and projects is the pillar sustaining Indra's leading position in Air Traffic Management, completely oriented to Customer needs and aimed at providing our Customers with the highest level of service.

Air Traffic Management references



Afghanistan	Dominican Republic	Liberia	Samoa
Albania	East Timor	Libya	Saudi Arabia
Algeria	Ecuador	Lithuania	Senegal
Angola	Egypt	Macedonia	Serbia
Anguilla	El Salvador	Madagascar	Seychelles
Antarctica	Equatorial Guinea	Malawi	Singapore
Argentina	Ethiopia	Malaysia	Slovak Republic
Australia	Faroe Islands	Maldives	Slovenia
Austria	Fiji	Mali	Solomon Islands
Azerbaijan	Finland	Martinique	South Africa
Bahamas	France	Mauritania	South Korea
Bahrain	Gabon	Mauritius	Spain
Belgium	Georgia	Mexico	Sri Lanka
Belize	Germany	Mongolia	St. Vincent & Grenadines
Benin	Ghana	Montenegro	St. Kitts
Bhutan	Greece	Morocco	Sudan
Bolivia	Greenland	Mozambique	Swaziland
Bosnia Herzegovina	Guatemala	Myanmar	Sweden
Botswana	Guinea Bissau	Namibia	Switzerland
Brazil	Guyana	Nauru	Syria
Brunei	Honduras	Nepal	Tahiti
Bulgaria	Hungary	Netherlands	Tajikistan
Burkina Faso	Iceland	New Caledonia	Tanzania
Burundi	India	New Zealand	Thailand
Cambodia	Indonesia	Nicaragua	Togo
Cameroun	Iran	Niger	Tonga
Canada	Iraq	Nigeria	Tunisia
Cape Verde	Ireland	Niue	Turkey
Cayman Islands	Israel	Norway	Tuvalu
Central African Rep.	Italy	Oman	Uganda
Chad	Ivory Coast	Pakistan	Ukraine
Chile	Jamaica	Palestine	United Arab Emirates
China	Japan	Panama	United Kingdom
Colombia	Jordan	Papua New Guinea	Uruguay
Comoros	Kazakhstan	Paraguay	USA
Congo	Kenya	Peru	Vanuatu
Cook Islands	Kiribati	Philippines	Venezuela
Costa Rica	Kosovo	Poland	Vietnam
Croatia	Kuwait	Portugal	Western Samoa
Cuba	Kyrgyzstan	Qatar	Zambia
Cyprus	Latvia	Romania	Zimbabwe
Czech Republic	Lebanon	Russia	
Denmark	Lesotho	Rwanda	

More than 4000 installations in over 160 countries

References at Jan-2017

Communication and Navigation

Garex

Digital Voice Communications Control System

The Indra's Digital Voice Communications Control Systems are specially developed for Civil and Military Air Traffic Control applications, either in real or simulated environments.

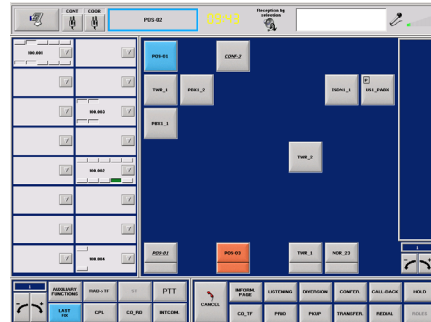
Indra's Voice Communication System architecture is designed to be easily adaptable to the requirements of every Customer in any Air Traffic System environment and efficiently respond to any network change while maintaining constant high network performance.



DVCCS Screen

This adaptability and efficiency, together with the most modern, innovative, well-proven and state-of-the-art technologies converge into Indra Voice Communication System to achieve the most existent goals in terms of availability and reliability. Its high reliability is supported by the use of Hot/Standby concepts of critical elements and great modularity.

The equipment, designed under PCM and ISDN technologies, uses HMI based either with touch type TFT screens or panels with push buttons and associated displays giving the operator, in a very intuitive way, and easy access to radio and telephone services with a wide range of possibilities.



DVCCS Screen

Indra Signal Multichannel Recorders

Neptuno is an Indra recording solution for Air Traffic Management (ATM). It records and replays the communications of the control centers and operator's consoles with accuracy and full availability. It has successfully proved its highest availability in more than 200 sites on five continents where it has been installed.

Neptuno is a modular recording solution that fulfills specific requirements of each user: AR (Audio Recording) and CR (Console Recording). Indra is developer and manufacturer of Neptuno system what makes possible to perform changes and add any functionality requested by the user.



Voice Recorder

NORMARC NAVAIDS

State-of-the-art NavAids

Indra's NORMARC Doppler VOR Ground Beacon from Indra is one of the primary navigational aids for a nation's airways system. It is a ground based, radio navigation aid, transmitting an omnidirectional signal that enables an aircraft to determine its bearing relative to the location of the beacon. Designed to exceed all ICAO requirements, it is the ideal complement to the DME.

NORMARC Distance Measuring Equipment (DME) is a ground based navigational aid for use by aircraft. Signals transmitted between an aircraft and a DME ground beacon enable the aircraft to accurately determine its distance from the beacon. The NORMARC DME is used at an airport or en-route, and is one of the primary navigation aids in an airways system.

The NORMARC ILS (Instrument Landing System) is a ground based precision approach aid to assist aircraft approach to runways. The system enables the aircraft to be maneuvered along a precise, predetermined, final approach path. The NORMARC ILS is configured for either Category I, II or III as per requirements of ICAO Annex 10.

The NORMARC ILS system comprises a Glide Slope (GS) system and a Localiser (LOC) system for vertical and horizontal course information on approach, and transmits coded signals to determine the amount of deviation from the optimum approach path.



DVOR-DME Antenna

Automation and Simulation

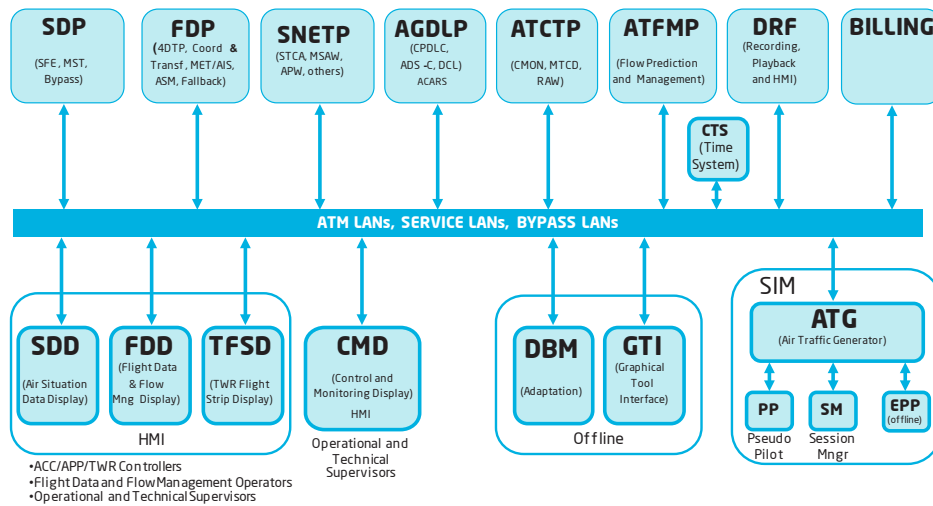
Integrated ATC Automation System

Advanced ATM Systems for ACC, APP and TWR ATC Centres

Indra's Advance Air Control Automation System 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 innovative use of state-of-the-art technology.

Having safety and reliability as the comes true of Indra's Automation System has served to make a user-friendly, easy to maintain system.



Automation System Overview

ACC APP & TWR SIMULATORS

Indra has an extensive experience in the provision of turnkey ATC training solutions, providing integrated ACC/APP and Tower simulation systems, either standing alone or with a real ATC replica system in back-up and contingency modes.

Indra has designed, developed and installed En-Route/Approach and Tower Simulation Systems in Europe, Latin America, Africa, Middle East and Asia. Our experience includes all phases, from design to commissioning, in addition to performing all developments and required Air Control Centre integrations when necessary.

Focused on its exhaustive didactical purposes, Indra's En-Route/Approach and TWR simulation system provides simultaneously a multi-exercise and multi-level of difficulty environment, in which the students/controllers receive their evaluation reports automatically, including infringements and workload. Voice, data and 2D/3D-images are recorded, synchronized with given instructions, that will be analyzed during exercise evaluation.

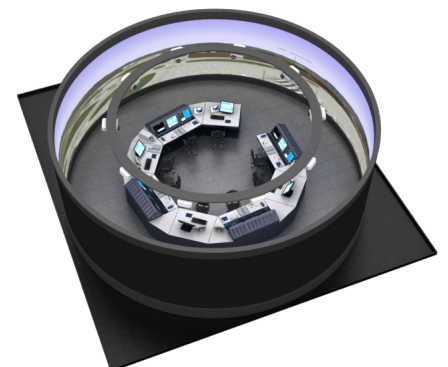
The Spanish Centre for Training of Air Traffic Controllers (SENASA) is a worldwide reference of integration of Indra's Simulators in a "Total Training Solution". Since SENASA centre was born in 1990, Indra has been continuously updating its systems and functionalities.

It represents the best tradeoff for ATC systems ranging from highly competitive COTS solutions to full-performance semi-custom systems.

Components

- Flight Data Processing (FDP)
- Surveillance Data Processing (SDP)
- Radar Data Compressor Unit (RDCU)
- Data Link Server (DLS)
- Situation and Flight Data Displays (SDD/FDD)
- Data Recording Facility (DRF)
- Control & Monitoring Display (CMD)
- Data Base Management (DBM)
- Simulation Subsystem (SIM)
- Safety Nets (SNET)
- Flow Management (ATFM)
- Electronic Flight Data Display (EFSD)
- Arrival Manager (AMAN)
- Data Analyzing Tool (AAT)

Nowadays, this centre contains three Enroute/Approach ATC simulators, six control tower simulators with 180° (three with 360°) environment, and CBT and Brief/Debriefing Rooms. More that one hundred students can simultaneously practice in different positions.



Surveillance

Primary Surveillance Radar & 3D Radar

Best Performance with the newest technology

Indra has more than 40 years experience in Surveillance Solutions design, manufacture, operation and integration, with a wide range of products covering any customer necessities. Indra Primary Surveillance Radar is a fully solid-state radar system that incorporates the latest technologies into a surveillance radar systems to provide outstanding features in terms of range resolution, minimum detection range, reliability and availability.

Additionally, Indra's PSR solution incorporates the AMTA-IV processing algorithm and the use of synchronous clutter map which improves tangential detection and visibility in heavy clutter environments. Thus, this system allows the air traffic controller to monitor all the aircraft in the airspace, clearly, simultaneously and without interference.

Medium and Long Range 3D Radar Latest technologies for Airport & Air Route Surveillance

It provides accurate aircraft position information, including flight height. These detection and 3D position estimation capabilities are achieved even under extreme conditions of weather, ground clutter and natural or man-made interference, and both with cooperative and non-cooperative aircrafts.

Besides aircraft detection and tracking, the radar includes a weather processor that provides the controller with the weather information required for safe air traffic control management.



PSR Antenna



3D Radar and MSSR-S Antenna

Monopulse Secondary Surveillance Radar

Enhanced mode S Surveillance Performance

Indra 40 years experience and knowledge in surveillance solutions, installing and putting into operation radar networks world-wide, has resulted in our fourth generation of secondary radars in Indra. It complies with the requirements stated by the International Civil Aviation Organization (ICAO) and with the performance demanded by EUROCONTROL to the surveillance and navigation mode S systems.

This Mode S system means a low cost and outstanding radar performance solution which provides the best accuracy performance in azimuth and range, the highest target capacity and range resolution in the market, and a superior availability and reliability. A very open and flexible architecture ensure highest performances and configurability either co-mounted with Primary Surveillance Radar or stand-alone.



MSSR Antenna

Surface Movement Radar

Indra's SMR is a continuous wave radar, state-of-the-art due to it is fully manufactured in solid-state technology which offers great flexibility to adapt to customer needs.

The radar is designed to detect and locate stationary, moving, individual and multiple targets located in airport manoeuvre and ramp areas at extended range even in low visibility conditions caused by fog or rain. Its solid-state low power design allows highly reliable operation with very simple maintenance.

Indra's SMR system provides a high resolution compared with other SMR. The continuous wave waveform together to the system processing techniques allows the system obtaining excellent performances.

This SMR is characterised by the high level of integration. The modular dual channel system composed by redundant transmitters, receivers and Radar Data Processor (RANC) system fully integrated in a single 19" rack.



SMR Antenna

MLAT & WAM

Airport deployment

For surface surveillance purposes the MLAT/WAM system consists on a distribution of receiving and transmitting stations inside an airport that receive the squitters and replies from the targets and a redundant Central process station. This Central process station correlates all the replies received and with the timestamp information calculates the position of the targets.

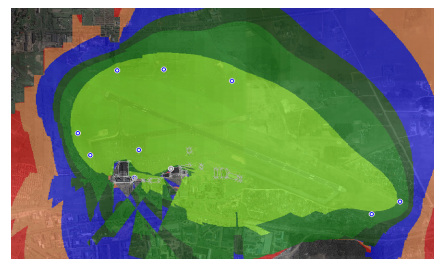
The MLAT/WAM system is distributed, in this way and not as rotating radars, the system is receiving data all the time, so the update of the information is much faster than traditional surveillance systems. In addition, the effect of the shadows produced by the buildings can be reduced to the minimum in the design phase and the service is provided in all parts of the aerodrome.

Wide Area deployment

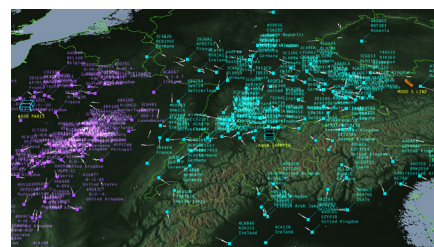
For Wide Area coverages MLAT/WAM system will be provided with receiving and transmitting stations deployed around the desired coverage volume. A Central process station correlates all the replies received and with the timestamp information calculates the position of the targets. When necessary the ECP orders the transmitting stations to interrogate in order to obtain the required information for targets.

The system includes BITE which allows for diagnostic and supervision. All this data is sent to the Control and Monitoring System, and the user has a real time picture of the situation of the system.

This CMS stores all relevant data and when necessary will create reports or report events defined by the user. As required on ED-142, CMS communication is based on SNMP protocol.



Multilateration Accuracy



ADS-B coverage in Europe

ADS-B

The Indra's ADS-B ground station is an equipment which brings the benefits of the Automatic Dependent Surveillance Broadcast with the best cost-performance ratio in the market. This system has been entirely developed and manufactured by Indra complying with the most exigent and recognized standards.

The equipment is designed to fulfil and/or exceeds the requirements, inputs and recommendations developed by FAA/RTCA ICAO, EUROCONTROL, and EUROCAE for the ADS-B systems as part of an air traffic control system, and can be adapted easily to meet the increased air traffic requirements that will occur in the future.



ADS-B Antenna

InNOVA A-SMGCS

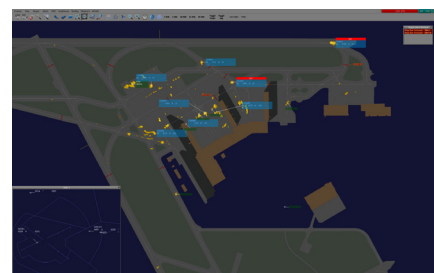
Integration of all sensors data for the safety of the airport movements

The main functions of an Advanced Surface Movement Guidance and Control System are: Surveillance, Control, Routing and Guidance.

The Indra Advanced Surface Movement Guidance and Control System is based on an open and flexible architecture offering high performances.

The system can integrate data from different surveillance sensors: Primary Surveillance Radar, Secondary Surveillance Radar, Surface Movement Radar, Automatic Dependent Surveillance Broadcast, Wide Area Multilateration, Multilateration and the airport sensors.

The integration of all these data ensures an accurate traffic picture and the safety of the movements in the airport area under all circumstances.



InNOVA A-SMGCS



ISO 9001:2000



indra

Crta Loeches, 9
Torrejón de Ardoz
28850 Madrid (Spain)
T +34 91 627 1957
F +34 91 627 10 10
infoatm@indracompany.com
www.indracompany.com

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