ATM Products and Services

iTEC Suite
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iTEC SUITE

iTEC Suite is a complete Air Traffic Management (ATM) system based on aircraft trajectory prediction and global interoperability.

iTEC Suite is the latest development of Indra’s ATM division, providing a highly modular and configurable solution for the future needs of the global air traffic market. Developed following the European Flight Data Processing (eFDP) specifications and including the outcomes of research and development activities from the SESAR (Single European Sky ATM Research) program, iTEC Suite is a fundamental step toward the objectives of the Single European Sky (SES) program, and is fully aligned with International Civil Aviation Organization (ICAO)’s Aviation System Blocks upgrades (ASBUs) definition and evolution strategy.

iTEC Suite is one of the most advanced ATM systems in the world, that integrates the latest technical developments in CNS/ATM with advanced Human Machine Interface (HMI) functionality, and offers a path for continuous evolution in response to new technologies.

iTEC Suite has been built upon two fundamental concepts:

▪ The 4D Trajectory, as the foundation of the ATM operations,
▪ Global Interoperability, supporting worldwide convergence.

In Trajectory-based operations, the flight path is no longer constrained by the airspace and user-preferred routing is applied wherever possible. iTEC Suite is able to predict more accurately where the flight will be, and therefore the controller can manage the flight in advance by means of conflict-free plans that avoid multiple tactical clearances. The controller is focused on monitoring the plan rather than giving instructions to keep separation, which makes the planner role more relevant and decreases the executive controller workload. Conflict-free plans mean more stable trajectories with fewer changes in level or speed, which requires less engine thrust and therefore implies reducing fuel consumption and emissions, making the flights smoother, quieter, shorter and more efficient and allowing Air Navigation Service Providers (ANSPs) to provide more effective services to their clients.

iTEC Suite enables SESAR’s trajectory based concept and is aligned with ICAO ASBUs strategy

The most advanced, safe and reliable ATM data processing and display system available today
Traditional Air Traffic Control was based on a structured airspace to facilitate conflict detection, with a number of predefined crossing points over which the flight paths could intersect, and the controllers separating the flights over those points. iTEC Suite allows free routing to achieve more efficient routes and profiles, supporting the controller in monitoring the traffic with a number of tools to keep safety at the highest level. The concept of Global Interoperability is supported by the iTEC Suite design based on the following principles:

○ Powerful information handling network for sharing data
○ New air-air, ground-ground and air-ground data communications systems
○ An increased reliance on airborne and ground based automated support tools

The iTEC Suite enables the sharing of accurate trajectory information which allows the increased use of "silent coordination" procedures. This means that most coordinations are automatic and only in exceptional situations, when the flight cannot comply with the planned coordination conditions, will the controllers be warned and advised to intervene. iTEC Suite will also propose a new coordination condition to the controller who can accept it, or change it and will help the controller with the negotiation of the coordination with their partner.

Trajectory based-operations and global interoperability using iTEC Suite reduce controllers’ workload by minimizing routine tasks, while increasing safety and productivity; increase individual flight efficiency by reducing flight diversions, flight time, fuel consumption and CO2 emissions, and support greater overall traffic capacity in airspace and easy integration with the wider ATM network.

iTEC COLLABORATION

iTEC stands for "Interoperability Through European Collaboration". The iTEC Collaboration is a long-term agreement that started in 2005 to develop common advanced ATM systems and share costs and activities among the partners using a common supplier, Indra. The iTEC Collaboration is currently led by ENAIRE, NATS and DFS as founding members, with LVNL as part of DFS System Group. The goal of this collaboration is to develop a high-end air traffic management system for busy and complex airspace, that meets the SESAR requirements and enables significant steps forward in productivity, iTEC's achievements provide a platform for synergies and thus cost reductions, helping to realize the vision of a Single European Sky (SES), with greater efficiencies and service standards for Europe’s airspace users.

Any organization can join the iTEC Collaboration through one of the founding members (NATS, DFS, ENAIRE). Alternatively an ANSP can be licensed to use iTEC through an implementation contract with Indra and paying a royalty fee.

iTEC members receive several benefits through collaboration, such as a reduction in operational expenditure and implementation risks through common software development, improvements in safety, training and transition through common processes and methods of operations, and interoperability with common flight data processing, controller working position and the use of open and standard interfaces.

Current partners: Spain, Germany, Netherlands, UK
Potential partners: Norway, Poland, Lithuania
iTEC SUITE CONTRIBUTING TO SESAR PCP

One of the challenges in Europe over the coming years will be deploying the technology and concepts that will help deliver the SES vision. The development of the new generation of technological systems is currently being managed by the SES ATM Research (SESAR) Joint Undertaking: a collaboration of the European Commission and the aviation industry.

The Pilot Common Project (PCP) identifies a first set of ATM functionalities (AFs) to be deployed in timely, coordinated and synchronised way so as to achieve the essential operational changes stemming from the European ATM Master Plan. In order to achieve the full benefits of the Pilot Common Project, certain operational stakeholders are expected to implement now those parts of the Pilot Common Project which are mature enough. Their involvement is to be ensured by the Deployment Manager in accordance with Implementing Regulation (EU) No 409/2013.

iTEC Suite represents a pragmatic solution today and beyond to allow a synchronized deployment of ATM functionalities, compliant with the PCP. iTEC Suite guarantees a system evolution aligned with the SESAR functionality roadmap and PCP AFs and the reduction of the deployment costs of iTEC Suite by sharing those costs between the ANSPs participating in the iTEC collaboration. Given these conditions, ANSPs who acquire iTEC Suite will be able to call for INEA funds for the deployment of iTEC Suite.

### iTEC Roadmap

#### iTEC V1:
- 4D Trajectory Based Operations
  - AF1: Extended AMAN
  - AF2: A-CDM
  - AF2: A-SMGCS
  - AF2: Airport Safety Nets
  - AF3: Dynamic Sect. and Advanced FUA
  - AF3: MTCD and CMON
  - AF3: Civil/Military coordination
  - AF5: FMS/AMHS, METAR/GRIB
  - AF6: AGDL (FANS1A & ATN)

#### iTEC V2.1 & V2.5:
- Full support to Upper and Lower Airspace
- Provision of advanced separation management tools for Planning and Tactical Control
  - AF1: Enhanced TMA using SNF
  - AF2: Integrated AAM/DMAN
  - AF3: Tactical Trajectory and Risk Modules
  - AF3: LARA II
  - AF3: Dynamic FRA
  - AF5: Contingency sectors
  - AF6: Complexity Manager
  - AF6: Flight service FIXM
  - AF6: ADS-C tracks

#### iTEC V3:
- Full support to IDP, SafeTime and 4D
  - AF3: NOP ITF
  - AF4: Collaborative NOP
  - AF4: ADS-C EPP trajectory
  - AF5: SafeTime (FIXM, AIXM, WXXM)
  - AF6: 4D
  - AF6: (IDP) ATC-ATC and ATC-NDM

### FEATURES

- **Advanced and user-friendly HMI** for displaying ATC information in real time, specifically tailored for En-Route, Terminal Maneuvering Area (TMA) and Approach Control (APP) operations at workstations optimized for executive and planner controllers, flight data operators and operational and technical supervisors.

  - **Safety**: Directs controller’s attention to where it is needed, to minimize the possibility of human error.
  - **Ergonomics**: Optimizes human factors dynamically, both at an ergonomic level – adapting to any physical build – and when it comes to usability – completely adjusting to every user’s preferences.
  - **Cognitive**: Supports new input devices and operator panels, designed with a view to new functionalities, to increase controllers’ performance, reliability and flexibility.

- **Work Environment**: Designed to provide a pleasant work environment to help user focus on their job.

- **Enhanced multi-sensor surveillance tracking**, including down-linked aircraft data, using Mode S sensors, Automatic Dependent Surveillance – Broadcast (ADS-B) and Multilateration (MLAT/WAM) data, as well as primary and secondary radar information.

- **Full Online Data Interchange (OLDI)**: silent coordination for external/interal ground-ground interoperability.

- **Ali-Ground Data Link applications and services** for aircraft-controller interoperability.

- **Advanced flight plan processing**, accurate 4-dimensional trajectory calculation and stripless operation.

- **Enhanced Safety Nets** (STCA, MSAW, APW, APN, NTZ) and tactical and planning ATM tools, including Conformance Monitoring and Conflict Management.
**BENEFITS**

The iTEC Suite offers the following benefits:

### Comprehensive ATM solution with tangible operational and business benefits
- Suitable for all operations, ranging from TMA and APP to En-route control, from low to high density traffic areas, and both civil and military.
- Increase in capacity by minimizing routine tasks while increasing safety and productivity.
- Interoperability between ATM systems using SESAR data interfaces.
- Trajectory based operations reduce flight diversions, flight time, fuel consumption and CO2 emissions.
- "Silent coordination" reduces workload per sector and human intervention.
- Datalink communications reduce the amount of voice communications and limit the probability of misunderstandings clearances.

### Optimized life cycle cost
- Ability to be part of the iTEC Collaboration program, sharing development costs and risks, having common methods of operations and improving safety, interoperability and training.
- Suitable for calling for INEA funds in order to deploy the iTEC Suite.
- Use of COTS technology from industry leaders (e.g. Linux, OpenGL).
  - Avoids the need for hardware or software development.
  - Simplifies maintenance and support activities.
- Open architecture by complying with established standards (e.g. AFTN/AMHS, FMTP, SNMP, ASTERIX).
  - Avoids premature technological obsolescence.
  - Ensures long-term support at reasonable cost.
  - Provides cost-effective evolution path.
- Support for a virtualized architecture at all layers: computing (vCPU/vRAM), network interfaces (vNICs), communications (VLANS, virtual switching and routing) and storage (virtual disks).

### Scalable design that allows future growth
- Modular architecture allows customers to build up their own ATM solution.
- Simplifies maintenance and logistics activities.
- Streamlines controllers and engineering training.

### High Reliability for service continuity
- Redundant hardware architecture (e.g. computers, network, etc.).
- Transparent switchover for redundant components.
- Fail-safe mode through reduced capabilities.
- Test or simulation facilities able to act as contingency systems.

### Fully compliant with all international and European standards (e.g. FIXM, SwIM, AIXM, GRIB2/METAR, FANS 1A - ATN B1 INTEROP STD)

### Excellent levels of Quality and Safety
- Safety Management System implemented at company level with a dedicated safety organization associated to the iTEC program.
- Compliance with safety regulations: ICAO, ESARR, European Directives, UK CAA.
- Engineering and software development processes fully compliant with global standards including ISO and CMMI and with safety standards: ED-153, DO278/ED-109, Sw01.

### A commitment to the future
- Ready to integrate the outputs of SESAR (e.g. i4D or iOP).
- Roadmap aligned with the SESAR functionality roadmap and Pilot Common Project (PCP) ATM functionalities (AFs).
- Full aligned with ICAO’s Aviation System Blocks upgrades (ASBUs).

### Looking for a sustainable future
- Applying rules and practices for sustainable development and environment with concrete objectives to reduce our carbon footprint and for energy saving.
- Enabling customers to meet their commitments to better flight efficiency through the implementation of new concepts such as flow management, continuous descent approach and flexible airspace structure.
FAQ

What does iTEC stand for?

iTEC stands for interoperability Through European Collaboration.

What is iTEC?

The iTEC International Collaboration is a long term agreement that started in 2005 to develop common advanced ATM systems and share costs and activities among the partners, using a common supplier.

What is included in the iTEC International Collaboration?

The iTEC International Collaboration includes the following elements:

- Advanced Flight Data Processor in evolution according to SESAR
- Middleware for ATM systems (iMAS)
- Controller Working Position

What is iTEC Suite?

The iTEC Suite is the complete catalogue of Indra ATM automation products, built upon core elements from the iTEC International Collaboration. The iTEC Suite provides a state-of-the-art comprehensive and modular ATM solution able to adapt to the specific needs of each customer.

Who is participating in the iTEC International Collaboration?

Current iTEC Collaboration is led by ENAIRE, NATS and DFS as founding members, with LVNL as part of DFS System Group. Indra being the technological partner and supplier of this international collaboration.

What level of influence do ANSPs have on the functional and technological roadmap?

The collaboration is fully ANSP driven, although sharing the supplier. Indra role is advisor, facilitator and supplier.

How can my organization as ANSP benefit from iTEC International Collaboration?

By one of the two following ways:

- as iTEC member, i.e. by joining the iTEC International Collaboration
- as iTEC user, i.e. by using iTEC Suite core product

How can my organization as ANSP join the iTEC International Collaboration as a member?

Your organization can join the iTEC International Collaboration through one of the Founding Members (NATS, DFS, ENAIRE) and an Entry Fee is applied. Being part of the collaboration, the New Entrant has the same rights as the rest of the members, is allowed to use the current version of the system and participates jointly in the long term evolution. This implies participation in the governance of the collaboration and supporting the joint system evolution.

How can my organization as ANSP benefit from the iTEC International collaboration as a user?

An ANSP can be licensed to use the most recent version of ITEC Suite core product through an implementation contract with Indra and a Royalty Fee.

TESTIMONIALS

The success in working together to achieve a Single European Sky

Maurizio Castelletti, European Commission Air Transport Directorate

"iTEC work is very present in several areas of the Single European Sky, so today’s signing ceremony for the new-generation iTEC Controller Working Position is of high relevance to Single European Sky objectives."

Ralph Riedle, Managing Director of Operations at DFS

"The introduction of P1/VAFORIT with its trajectory-based flight data processing system is not just a step into the future. It is a quantum leap. From a technological perspective, DFS has paved the way for the route to SESAR. This first success is just one achievement within the cooperation agreement among DFS, AENA and NATS, which the Dutch LVNL has also recently joined, with Indra as technology partner. This agreement, the iTEC program, seeks to achieve more interoperability among European countries and enables these countries to jointly align themselves with the SESAR goals."

Martin Rolfe, Chief Executive Officer at NATS

"iTEC will be key to the future success of some of the busiest airspace in Europe and, indeed the world. We have a long track record of collaboration with Indra and we’re delighted to now be working with them on what is a vitally important project for the deployment of SESAR."

Paul Riemens, Chairman of the Executive Board at Air Traffic Control the Netherlands

"We have implemented today to a far-reaching, cross-border cooperation between air traffic control organizations in the interest of European aviation. With the new joint system, we can improve our services by offering shorter routes and more capacity. It also gives us new technical possibilities to fly quieter."

Ignacio González, Director of Air Navigation of ENAIRE and Chairman of the iTEC board

"Working together through collaborative ventures such as the iTEC Controller Working Position, which integrates the most advanced features of SESAR developments, I am fully convinced, is the most effective way to deliver ANSP efficiencies and enhancements, for the benefit of everyone within the aviation community, including passengers."

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iTEC SUITE PRODUCTS

iTEC Suite products deliver improvements in efficiency and advanced technology.

The iTEC Suite products are divided into two levels: Core and Complementary products.

The Core product is the foundation of the iTEC Suite. One of the most advanced ATM system in the world. It provides automated assistance to ATC personnel through the following functions, delivered by their corresponding SW components:

- FDP (Flight Data Processing Function)
- CWP (Controller Human Machine Interaction Function)
- MTCD/CTM/TTM (Conflict Management Function)
- IOMP (Integrated Operational Management Function)
- CMS/TSP/RS/DAT (Technical Support Function)
- ISS (External Flight Information Supply Function)

The Complementary products provide the complete catalogue of ATM functionality able to support a comprehensive and flexible air traffic management solution, fulfilling any customer needs. The iTEC Suite Complementary products are the following:

- ISDPS (Indra Surveillance Data Processing System)
- ISNS (Indra Safety Nets System)
- ITCM (Indra Traffic Complexity Manager)
- IXMAN (Indra Integrated Arrival/Departure Manager)
- ITBS (Indra Time Based Separation System)
- ISWIM (Indra SWIM Interoperability Node System)
- ITAP (iTEC Adaptation Platform)
- ASIM (Indra ATM Simulator)
- iUTF/ART/ESS (Indra Test Automation Tools)
- Indra ATM Console

Each iTEC Suite product can be deployed independently and integrated within the customer ATM system. The products have also been designed to work closely with each other (e.g. as part of an iTEC Suite system), providing a seamless capability tailored for today’s complex air traffic management environments. The iTEC Suite products’ design allows them to be integrated easily into different ATM environments, allowing customers to make up their own ATM systems, acquiring only what the customer needs at each moment.

When “business as usual” is not quite right for our customers, bespoke solutions based on the iTEC Suite can be provided that satisfy a business-critical feature or function not available with the existing products. iTEC Suite products would be customized to meet our customer’s unique requirements in these cases.

iTEC Suite supports the only trajectory-based operations in use across Europe.
iTEC SUITE PRODUCTS

### PRODUCTS

- **iTEC Suite CORE PRODUCT**
  - FDP (Flight Data Processing Function)
  - CWP (Controller Human Machine Interaction Function)
  - MTCD/CTM/TTM (Conflict Management Function)
  - IOMP (Integrated Operational Management Function)
  - CMS/TSP/RS/DAT (Technical Support Function)
  - ISS (External Flight Information Supply Function)

- **iTEC Suite COMPLEMENTARY PRODUCTS**
  - ISDPS (Indra Surveillance Data Processing System)
  - ISNS (Indra Safety Nets System)
  - ITCM (Indra Traffic Complexity Manager)
  - IXMAN (Indra Integrated Arrival/Departure Manager)
  - ITBS (Indra Time Based Separation)
  - ISWIM (Indra SWIM Interoperability Node)
  - ITAP (iTEC Adaptation Platform)
  - ASIM (Indra ATM Simulator)
  - ITAT (Indra Test Automation Tools)
  - Indra ATM Console

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### iTEC SUITE CORE PRODUCT

The iTEC Suite Core product incorporates the latest operational concepts validated in SESAR and the capabilities of the only trajectory-based ATM systems that are already available and in operation across Europe, i.e. DFS (Karlsruhe) since December 2010 and NATS (Prestwick) since January 2016.

The iTEC Suite Core product provides a safe and reliable solution for delivering an efficient ATM service, and able to integrate with the customer infrastructure using standardized and widely used interfaces.

The main capabilities provided by the iTEC Suite Core product are as follows:

- Advanced and user-friendly HMI specifically tailored for use by En-Route, TMA and APP controllers, flight data operators and operational and technical supervisors.
- Advanced flight data processing and accurate 4D trajectory calculation.
- Full OLDI silent coordination for external/internal ground-ground interoperability.
- Air-Ground Data Link applications and services for aircraft-controller interoperability.
- Enhanced tactical and planning ATM capabilities, including Conformance Monitoring and Conflicts Management.
- Flight Plan data distribution to other external ATM systems and agencies.
- Enhanced supervision and analysis capabilities, including technical monitoring and control of the system and recording of ATM data (e.g. surveillance, flight data, etc.) for further analysis and incident investigation purposes.

These ATM features are supported by a set of system functions, which in turn, are delivered by one or more of the iTEC Suite Core product's components. This modular architecture improves the flexibility, reusability and extensibility of the product, and facilitates its evolution and maintenance. The following sections describe the functions and the Core Product components which supports them.

### iTEC Centres

- Prestwick
- Bremen
- Amsterdam
- Swanwick
- Langeren
- Karlsruhe
- Munich
- Barcelona
- Madrid
- Mallorca
- Seville
- Canary Islands

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**FLIGHT DATA PROCESSING FUNCTION**

This function is the basis upon which advanced operational concepts, centered around trajectory-based operations, can be built. It is responsible for processing and managing flight plans. It provides real-time flight information and other processed ATM data (e.g., surveillance, meteorological, etc.) to other functions, provides correlation and flight path monitoring, enables automated co-ordination between internal sectors and with adjacent air traffic control centers and manages the air-ground data link communications. The most significant capability, however, is the 4D trajectory calculation, which utilizes flight plan, meteorological, surveillance and aircraft performance data combined with airspace and supported by the ATC procedures to calculate the expected trajectory of the flight in four dimensions.

**Features**

- Compliant with the standardized EUROCONTROL requirements for Flight Data Processing systems (FDPs) and incorporates the latest operational concepts validated in SESAR.
- Reception, validation and processing of flight plan messages (AFTN/AMHS) and manual inputs.
- Aircraft identification and SSR code management – ORCAM/Mode-S/CCAMS.
- Correlation of flight plans with surveillance data and flight path monitoring.
- Advanced analysis of flight plan routes and accurate calculation of 4D flight trajectories, including estimated times and levels. Supporting free-route and stripless operations.
- Full OLDI coordination for external/internal ground-ground interoperability.
- Support for datalink networks (ATN, FANS-1/A), Applications (CM/AFN, CPDLC) and the main Air-Ground Data Link (AGDL) Operational Services (e.g., maps, tracks, symbols, labels, speed vector) and information regarding airspace status and weather radar data.
- Integrates information from multiple external and internal sources (e.g., flight plan data, surveillance data, conflict alerts, radar weather information).
- Links displayed artifacts – for example, links surveillance data with relevant flight data through hook and highlight.
- Makes flexible use of the display area – windows can be displayed on any area of the workstation display(s) and are movable by the user, where acceptable from a safety perspective.

**Benefits**

- Improves controller efficiency by reducing controller intervention per flight.
- HMI design directs controller attention to where it is needed to minimize the possibility of human errors.
- Provides controllers with an integrated solution where they can find the right information at the right moment.
- Increases ANSPs productivity (by reducing operating costs) and keeps the very high safety standards that the community deserve.

**CONTROLLER HUMAN MACHINE INTERACTION FUNCTION**

This function encompasses all the capabilities related to data presentation and user interaction with the air traffic controller. It provides a HMI that integrates surveillance, flight and other operational data (e.g., meteorological, airspace, alerts, etc.) in an efficient manner, appropriate for an assigned user role and fully consistent with Human Factors principles. It also provides a set of advanced tools to assist the controllers in the decision making process, depending on the kind of responsibilities the controller is performing at a moment.

**Features**

- Modern HMI with advanced graphical representation and comfortable input devices, fully configurable according to the controller role.
- Displays the traffic geographical picture and integrates the most relevant information for the controller at each time.
- Provides all standard features derived from the EUROCONTROL studies (ODID III and IV) on HMI for air traffic controllers (e.g., maps, tracks, symbols, labels, speed vector) and information regarding airspace status and weather radar data.
- Integrates information from multiple external and internal sources (e.g., flight plan data, surveillance data, conflict alerts, radar weather information).
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CONFLICT MANAGEMENT FUNCTION

This function provides automated decision-support and real-time assistance to both planning and executive controllers, for detecting conflicts between aircraft trajectories, considering planning constraints and tactical clearances. This function is provided by a set of components that are based on the accurate 4D trajectories computation, and covers the whole conflict management capabilities range.

The Medium-Term Conflict Detection (MTCD) component is aligned with validated SESAR concepts and supports all conflict management capabilities by itself. The Coordination Trajectory Module (CTM) and Tactical Trajectory Module (TTM) components are designed to manage risks and conflicts separately based on the planning/coordination and tactical/deviation trajectories respectively. Acquiring one or a combination of these components will depend on the customers’ needs.

Features

▪ It is the basis for free-route and stripless operations, as monitoring of traffic separation is performed anytime and anywhere, and not at predefined crossing points.
▪ Computes potential conflicts between aircraft pairs based on the tactical trajectory resulting from controller clearances. Controllers are warned if aircraft are predicted to violate the separation criteria with respect to any other aircraft.
▪ Computes 3D risks (e.g. En-Route Risk, Entry Risk, Exit Risk, etc.) based on the planned trajectories of the flight plans for those controllers whose managed airspace is crossed by the involved flights.
▪ Warnings can be configured with the related threshold parameters by means adaptation data.
▪ Allows probing possible alternative plans to solve a conflict (“What-if” probe).
▪ Allows checking if tactical inputs would be conflict free for a certain time horizon (“What-else” probe).

Benefits

▪ Early recognition of potential conflicts and follow-on planning actions.
▪ Reduction of executive controller intervention, thus improving safety.
▪ Significant increase in sector capacity (beyond 30% in simulated environments) from recent operational use and SESAR validations (2014-2015).
▪ TTM functionality has already demonstrated its suitability in SESAR (P4.7.2 Validation Report Iteration 3).

INTEGRATED OPERATIONAL MANAGEMENT FUNCTION

This function encompasses all the activities related to data presentation and user interaction with the flight data operator and operational supervisor. It provides a HMI which integrates the capability of amending and correct messages rejected by either the automatic flight plan creation process or the automatic route calculation process providing; creation, modification and cancellation of manual system flight plans and providing management for the distribution of Air Traffic Controller (ATC) work between the available resources (including controllers and automatic functions) based upon sectorization data. Additionally, it gives support for performing several configuration tasks (e.g. sector consolidation, special areas, variable system parameters) and changing system-wide operational parameters (e.g. display modification alerts, assignment of flight data operator role plans and management of some airspace use, QNH, wind and temperature data).

Features

▪ Web-based solution with a user friendly and intuitive HMI which improves user experience.
▪ Web-browser clients architecture which allows this function to be accessed from different platforms.
▪ Fully compliant with safety regulations (e.g. ICAO, ESARR, European Directives, UK CAA), global standards (e.g. ISO and CMMI) and safety standards (e.g. ED-153, DO278/ED-109SWD1).
▪ Integration of flight data operator and operational supervisor functions into a single GUI.
▪ Supports multiple roles to tailor the functionality to each validated user (e.g. supervisor, specialist, sector related, operational, assistant, etc.) per instance.
▪ Displays sectorization information on a 2D map by level to easily monitor the situation and activate the most appropriate sector configuration.

Benefits

▪ A flexible, scalable and efficient usage solution.
▪ Lean, clean and visual application.
▪ Commonality reduces hardware, maintenance and software upgrade costs.
▪ Designed to optimize the functionality for users with advanced technology.
▪ Modern, easy and intuitive Look&Feel GUI.
▪ Accessible from different devices technology and independent to the connectivity, wired and wireless.
TECHNICAL SUPPORT FUNCTION

This function provides all capabilities required to ensure that the iTEC Suite Core product is performing as expected and according to the agreed service levels. It encompasses the control and monitoring of iTEC Suite Core components, recording of all relevant ATM data and log files, and analyzing and assessing all previously recorded data for different purposes: check the correct behavior of the system, evaluate system performance, generate reports, etc.

Features
- Provides full control and monitoring capabilities and situational awareness for the complete iTEC Suite Core product.
- Provides a SNMP-based interface supporting control and monitoring from external systems.
- Offers a user-friendly Java-based HMI interface which integrates the control and monitoring of all iTEC Suite Core components and connection status to external systems.
- Global recording of ATM data, such as surveillance, flight plan and meteorological data and user inputs for subsequent analysis purposes.
- Use of previously recorded data to generate statistical and traffic reports and support incident investigation of the iTEC Suite Core operation.
- Provides two main operational analysis modes: Online mode which allows users to have quick access to reports of all messages exchanged between iTEC Suite Core components and external systems, and Offline mode which creates a relational database of external and internal messages, to generate static and dynamic reports.
- Offers a user-friendly Java-based HMI which integrates the analysis of previously recorded ATM data and the generation of different reports allowing a clean, flexible and usable environment for users.
- Automation capabilities on system deployment, able to adapt to specific physical environment.

Benefits
- Open and easy integration for global supervision by using the SNMP protocol.
- Clean, flexible and usable environment for end users.
- Reliability, high availability and short response times.
- Ensures service continuity, data integrity and easy portability to other platforms.
- Support legal recording and incident investigation capabilities.

EXTERNAL FLIGHT INFORMATION SUPPLY FUNCTION

This function provides support for a set of authorized external flight data users to subscribe to a general communication service, for receiving flight plan data in a periodically manner or to perform queries on specific flight plans on demand. It also provides the capability of defining and applying filters for the selection of flight plans of interest.

Features
- Support for two types of external clients: Subscription and Query.
- Management of authorized external clients (e.g. creation, deletion and validation as authorized system).
- Management of the physical and logical connections with the external clients by using standard protocols (e.g. IPv4 and IPv6).
- Provision of a flight plan subscription service using international standards (ADEXP and ICAO).
- Distribution of updated flight plans to corresponding external client, when there is a change in certain fields of a flight plan selected of interest.
- Allows the definition of filters based on a set of flight plan fields (e.g. departure aerodrome, flight plan state) for selecting flight plans of interest.
- Accepts queries from external clients to retrieve flight plans fulfilling several criteria (e.g. callsign, SSR code).

Benefits
- Provides a safe, effective and highly reliable flight data provision service.
- Supports scalability in the number of authorised users and provided services.
- Ensures data integrity, service security and continuity.
- Facilitates the integration of external systems using standardized interfaces.
Indra SURVEILLANCE DATA PROCESSING SYSTEM

This system processes the input from different sensors (e.g. PSR, SRR, Mode S, ADS-B and MLAT) to provide a combined estimate of the position, altitude and identity of multiple aircraft. This information supports the establishment of accurate situational awareness of air traffic for a well-defined geographical area along with the distribution to interested users (e.g. flight data processing systems, controller’s HMIs, safety nets).

**Features**

- Sensor data input processing and real-time quality control.
- Multi-sensor tracking and fusion (IMM Kalman filters)
- Configurable filtering of input data to adapt to any sensors quality environment.
- Processing of input data in ASTERIX Cat. 1, 2, 34, 48, 21, 23, 32 and distribution of output data in ASTERIX Cat. 62, 63 and 65.
- Environment assessment function to monitor and evaluate the surveillance processing function and generate reports and statistics in real-time.
- Configurable distribution services of system tracks to interested users.
- Main/stand-by switchover, without any loss/discontinuity in the air traffic situation picture, completely transparent for users.
- Fulfils EUROCONTROL standards and requirements.

**Benefits**

- Tracking accuracy, reliability and processing capacity for a wide range of surveillance technologies.
- Limiting to a minimum the impact in the ATC environment, due to new surveillance techniques, by using standard interfaces.
- Configurable to any surveillance infrastructure, in terms of sensor’s input and distribution of processed output.
- Provides to airspace users high quality and cost-effective surveillance services.
- Simple but robust architecture that ensures the same level of high reliability, stability, performance and safety.

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Indra SAFETY NETS SYSTEM

This system helps prevent imminent or actual hazardous situations from developing into major incidents or even accidents. It provides ground based safety nets, intended to assist air traffic controller by generating, in a timely manner, alerts of an increased risk to flight safety, which may include some resolution advice. This system processes information from the ATM system and derived data from the aircraft (e.g. Mode C/S and Enhanced Mode S) and detects present or potential conflicts which compromise the required safety levels, in order to present them to controllers. Upon receiving an alert, controllers are expected to immediately assess the situation and take appropriate action.

**Features**

- Highly configurable for different parts of airspace to ensure its optimal operation even in complex environment with different characteristics and operation modes.
- Aligned with SESAR Plans, fully complying with EUROCONTROL standards and ICAO ASBUs.
- Delivers alerts in ASTERIX Cat. 4 format for STCA, MSAW, APW, NTZ and APM/DPM, besides NTCA conflicts.
- Mainly based on surveillance information in order to provide proper and accurate information for typical warning times around 120s.
- Online configuration by operational supervisors, including Safety Nets activation, special areas, STCA volumes, QNH, runways configuration and filters by SSR/Callsign and VFR/OAT flights.
- Minimize the number of false and nuisance alerts by including logical rules and flight data analysis.
- Seamless easy integration due to use of standardized interfaces.

**Benefits**

- Increase Safety levels.
- Increases controllers awareness and confidence whilst simultaneously reducing the number of false/nuisance alerts.
- Improves efficiency with early detection of conflicts.
- Provides an additional safety margin on top of the inherently safe provision of ATS.
**Indra TRAFFIC COMPLEXITY MANAGER**

This system is responsible for assessing whether an air traffic configuration may cause unsustainable workload to Air Traffic Control Operators (ATCOs) and providing guidelines on how to obtain more manageable sectors by reconfiguring the airspace and by modifying traffic patterns. It calculates sector loading on the basis of planned trajectories. In a self-separation environment, this sector load data can be used to identify areas of predicted high traffic density where excessive tactical maneuvering might be required to maintain separation.

**Features**

- Supports medium to short-term decision-making about tactical airspace and traffic management.
- Provides information about the sector load referred to hourly entry rate, occupancy and controller workload based on predicted 4D trajectory.
- Prediction of sector load is based on the information received from the flight data processing system and 4D flight profiles received from European Network Manager.
- Flexible workload calculation engine, easily adaptable to support advanced KPI prediction (e.g. CO2 emissions, noise).
- Allows probing of possible alternative traffic and airspace plans in order to reduce workload ("What-if" probe).
- Proposes an optimal sector plan based on predicted traffic.
- Strategic conflict management (conflict handling through airspace organization and management, demand and capacity balancing and traffic synchronization).
- Native support to Short-Term ATFCM Measures (STAM) process, using System Wide Information Management (SWIM) services to coordinate local demand and capacity measures with other stakeholders (ANSPs, airports, airspace users, Network Manager).
- New advanced HMI based on state-of-the-art technology, designed natively for direct tactile interaction by means of a multi touch interface, implementing simple gestures, inspired on the ones used daily in mobile phones and tablets (tap, zoom in/out...).

**Benefits**

- Ability to manage more traffic with no increase to ATCOs workload.
- Securing airspace while increasing air traffic capacity handling.
- Improving short-term traffic demand forecasts.
- Increase Safety (i.e. solve potential overloads and bunching, reduce en-route airborne holding, management of unusual events).

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**Indra INTEGRATED ARRIVAL/DEPARTURE MANAGER**

This system provides users with a sequence of flights, generating a smooth flow of arrival and departure traffic at an aerodrome. All the sequences are calculated based on different criteria trying to reduce the total delay of the flights, taking into account the capacity constraints and keeping the safe separations defined between flights. It can also provide sequences at any point in the airspace (such as TMA sectors). Moreover, it can be extended to pre-departure phase, so it can provide the clearance controller with a sequence of target start-up approval times.

**Features**

- An integrated AMAN/DMAN solution compliant with the Airport Collaborative Decision Making (A-CDM) process.
- System for En-Route, TMA and APP controllers with the computed sequence timeline and the control actions to properly expedite the traffic.
- Highly configurable. It can be easily adapted to local characteristics and procedures (e.g. dependent runways or waypoints, mixed mode runways) and supports online modifications of configuration data.
- Easy integration with other components and flexible design which allows it to be integrated with other functions easily, as CDM or routing functions, so the provided sequences will be more accurate.
- Computes the total delay of each sequenced flight, which is useful to perform traffic adjustments with the aim of complying with the planned sequence.
- Assists the controllers in the decision making process by proposing different maneuvers to absorb the delay for arrival flights (e.g. arrival procedure change or holding maneuvers).
- User-friendly HMI, fully integrated in the controllers HMI, which presents relevant information depending on the situation.

**Benefits**

- Assistance and reduction of the controller workload with a complete schedule of flights.
- TMA and aerodrome coordination which reduces the amount of communication between air and ground controllers.
- Improves airport efficiency by adjusting the throughput proposed by iXMAN to the airport capacity.
- Reduction of environmental impact and aerodrome pollution by reducing holding manoeuvres and supporting predeparture phase.
Indra TIME BASED SEPARATION

This system uses time-based scheduling to give controllers better predictability on airspace use, helping to optimize the traffic stream of aircraft into capacity-constrained areas. It provides a consistent time spacing between arriving aircraft in order to maintain runway approach capacity, no matter the headwind conditions.

Features

- Takes advantage of wake vortex quick dispersion in strong headwinds; this fact makes it possible to reduce the distance between landing aircraft.
- Flight plan information from the flight data processing system and tracks received from the surveillance data processing system, which includes updated speed and positioning information, are used for calculations.
- Enables aircraft to be spaced closer together on approach in terms of distance but with no reduction in the time interval between landings.
- Provides a user-friendly HMI for delivering the required separation minima between aircraft.
- Target distance indicators and detected infringement alerts over those indicators or unexpected A/C positioning, are displayed on the extended runway centerline of the final approach controller’s situation display and the tower runway controller’s display.
- Displays customized information for approach and control towers.
- Adds additional metering points further out from arrival airports, allowing controllers to provide earlier integration of arriving flights, during the en-route phase.
- Sorts flights in the approach phase according their expected arrival order and their assigned runway, using information coming from the integrated Arrival/Departure management system.
- Fallback mode to Distance-Based Separation (DBS) + indicators.

Benefits

- Very high level of situational awareness.
- Increase of runway throughput and efficiency.
- Reduction in delays, cancellations and consequent operating costs.
- Global reduction in workload.
- Shorter overall flight times.

Indra SWIM INTEROPERABILITY NODE

This system supports ATC-ATC interoperability as communication infrastructure in support of flight information exchanges as described in EUROCAE’s ED-133, but that is prepared to extend its use to wider stakeholders and domains. This infrastructure is implemented in deployable elements called SWIM nodes that may support to one or several stakeholders. The SWIM node enables the sharing of Flight Object (FO) data where producers and consumers of flight information can exchange the data via an IP-based Service Oriented Architecture (SOA) network. It ensures that all parties have a consistent view of the FO, and that the data is widely and easily available, subject to appropriate access controls.

Features

- Enables self-separation operations, by supplementing direct air-to-air communication with ground support for information sharing.
- Provides a safe information environment which enables all ATC stakeholders to have suitably controlled access to flight data.
- Provides standardized flight information via standard interfaces and (network) infra-structure which provide the required Quality of Service (QoS).
- Based on a logical architecture which provides all eligible stakeholders with appropriate access to an up to date set of FOs.
- Full SWIM compliant solution which follows all ICAO GANP/ASBU, SESAR and NextGen principles.
- Follows a service-oriented approach which decouples consistently producers from consumers of information.

Benefits

- Benefits derived from the use of SWIM interoperability (e.g. wider access to ATM information, safety, cost efficiency, environmental impact, service improvement, increased efficiency and capacity).
- Provides reliable and efficient connectivity.
- Increases the performance of European Airspace.
- Supports continuously updated flight information.
**iTEC ADAPTATION PLATFORM**

This system provides capabilities for managing and distributing the required sets of Adaptation data, required by the different iTEC Suite products, in the flexible but robust way the current dynamic environment demands. It is also able to provide Adaptation data to any ATM system on standardized XML-based format.

**Features**

- "error-state" working, allowing the user to work freely with complete validation of the data performed when requested.
- Enhanced definition and maintenance of the adaptation data following the Aeronautical Information Conceptual Model (AICM).
- Intuitive structure and user friendly GUI, based on windows and menus, for the entry and maintenance of adaptation data that helps to ensure data consistency and completeness.
- Maintenance of complete single sets of adaptation data to support different configurations of the system.
- Supports more useful and manageable graphics (maps): Single Map interface, Control Map display via Tree-View selection, fast and high-quality 3D visualization, 2D data edition and Tabular data.
- Complies with ISO 19115 for storing Geographic Information/Metadata.
- Recognition of the most important formats for data exchange:
  - Information can be automatically imported from AIXM, BADA model, CSV, XLS or XML.
  - Adaptation data can be exported to AIXM, XLS, XML, CSV and KML.
- Integrated adaptation data description to provide the user a quick access to the System requirements.
- Use of a COTS relational database manager, formatted for each of the iTEC Suite’s components or external systems.

**Benefits**

- Provides the necessary consistency and integrity in the data to avoid unexpected behaviors.
- Flexibility and robustness to improve usability.
- User-Centered design to provide an easy to use tool.
- Enables rapid deployment of updated versions.

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**Indra ATM SIMULATOR**

This system provides the necessary infrastructure to facilitate training, testing and validation activities using simulated or previously recorded traffic situations. It contains a replica of the Operational iTEC Suite with the same capabilities, operational characteristics, appearance, interfaces and functionalities. It also includes the same types of working and support positions as the ones that are used in operations.

**Features**

- Provides a total training for 2D/3D-TWR/APP/ACC controllers in a multi-exercise and multi-adaptation system.
- Supports multiple and independent training exercises for ATC controllers and operators, in simulated traffic scenarios, using a replica of the Operational iTEC Suite and a simulator that emulates the external interfaces to the ATS facility.
- Off-line creation and maintenance of the simulated sessions and exercises via a user friendly interface. Flights creation from recorded data from operational system. Exercises preview using different speeds.
- Simulates an unlimited range of high complexity operational situations, information of air/ground movements from surveillance sensors, flight plans and other ATM information (e.g. trackers, weather radar information, GRIB messages, AFTN/AMHS switching, datalink (ATN/FANS), ADS-C, external coordination, Playback, Student Evaluation).
- Facilitates testing and validation activities (e.g. testing new software releases, testing adaptation data changes) of the iTEC Suite during its operational life, allowing real and training time (with different speeds).
- Offers the possibility of using the replica of the Operational iTEC Suite in contingency mode in case of failures in the main (operational) system by simply reconfiguring the simulation environment.

**Benefits**

- Enhance basic and advanced training of TMA/APP/En-Route controllers.
- Cost-effective training solution by reducing the training time.
- Safe and well-controlled environment to test, examine and evaluate an ATM system.
- High fidelity with respect to the real operational system.
Indra TEST AUTOMATION TOOLS (1/2)

Indra's initiatives on Test Automation Tools include the following products, which can be used independently or integrated to cover different testing capabilities.

Indra Unit Testing Framework (iUTF)

iUTF is a versatile and powerful multi-purpose Unit Test and System Test environment, developed to support and automate software testing, including both white and black box testing. iUTF performs four basic tasks:

- Automated actions: scripted
- Control flow and traceability: check functions called by an input and allows tracing and correlation between the code flow and design diagrams (use cases)
- Data flow: check the output parameters and verify the correctness of obtained response data. Allows automated unit testing and automated test regressions
- Code coverage: identify executed source code lines, producing coverage statistics

Development or Test Engineer is able to define a set of test steps (scripted in TCL), and execute them on the system, achieving automated test verification, observing the percentage of covered code, and proving the traceability of Design Low Level Requirements to procedures. The entire test results, coverage and traceability data is collected in a repository for later analysis that is accessible through a web interface, which also provides statistics and summarized data.

iTEC External Systems Services (ESS)

ESS consists of a set of adapters and a main Web Server, which provides complete access to iTEC systems through an open standard protocol (XML over HTTP). Every access to the iTEC system is made through a predefined catalog of Web Services exposed via ESS Framework. This catalog includes: HMIs testing, adaptation data management, command line actions and ITG Simulator interaction.

ESS contains the following features:

- Support multipurpose clients with different implementation languages.
- Quickly develop or prototype stubs/emulators or small tools for development testing.
- Create visualization/monitoring tools for system data, internal state, etc.
- Use any device running a dedicated application to access selected iTEC Data.
- Connect any Test Automation Framework, such as Robot Framework, iUTF, etc.

Indra TEST AUTOMATION TOOLS (2/2)

ESS supports keyword-driven testing, which separates the documentation of test cases -including the data to use- from the prescription of the way the test cases are executed. These capabilities enable ESS to automate the complete system testing activities both at factory and on site. Test results are collected and accessible through a web interface, providing statistics and summarized data.

Indra Automated Remote Testing (ART)

ART provides a non-intrusive form of testing via controllable HMIs, i.e. automate interactions to graphical user interfaces. ART provides a simple and friendly GUI tool for preparing, managing and executing tests with limited knowledge of the system.

ART consists of a lightweight server and client application that can be easily deployed on any platform/system, and does not require any modifications to the software being tested. It is based on a powerful image recognition engine capable of handling GUI inputs in HMI clients and monitor test results. The server provides the ability to coordinate system testing on a combination of subsystems via the creation of server scripts, which drive a test procedure on several clients. The client provides the ability to create simple and intuitive test scripts by using an image recognition library to handle GUI inputs in HMI clients. Test results are generated in HTML format with images and collected at the server for later analysis.

ART allows automation of sanity checks and system testing on HMIs for any application, including iTEC Suite products.

Benefits

- Continuous and simplified integration.
- Automate the complete system testing activities both at factory and on site.
- Increase test speed, test efficiency and software quality.
- Provide a centralized Keywords, Resources, Test suite/cases repository.
- Decrease costs and improve accuracy by reducing repetitive manual tests.
Indra ATM CONSOLE

This product provides the ATM working platform which includes the working space, general equipment and furniture used, and physical environment in which air traffic controllers work. This product merges our global experience in Air Traffic management with leading-edge technologies in visual display and gestural interaction, integrated within a modern design engineered from SESAR requirements on human factors.

Features

- Improves systems integration and flexibility in the same visualization area.
- HMI design directs controller attention to where it is needed, at any time, to keep human errors to a minimum.
- Red Dot product award 2012.
- New input devices and operator panel designs to increase controllers’ performance, reliability and flexibility.
- New technologies such as multi-touch and ultra-high resolution screens to allow several configurations, adaptable to all needs.
- Reduces user resistance to changes by using modern and well known technologies, as multi-touch.
- Creates a clear and calm job environment, reducing ambient noise and visual noise, adapting all the physical and virtual space, to the particular needs and requirements of each single user.
- Modular design that makes maintenance, installation and shipment simpler to carry out, thus reducing time spent on them.

Benefits

- Optimizes human factors on the fly, both at an ergonomic level –adapting to any physical build- and when it comes to usability -completely adjusting to every user’s preferences.
- New operational functions designed to make control configurations more flexible and adapted to all roles in the room.
- A simplified position leading to less hardware being close to the controller, thus improving temperature conditions, reducing vibrations and abating noise.
iTEC Cloud brings modern cloud computing technology into air traffic management, allowing iTEC Customers to address the coming businesses challenges from the right position.

Air Navigation Service Providers, ANSPs, have to face an environment that is getting more and more complex in recent years. The Single European Sky initiative defines clear targets to each country to improve their performance on cost, delays, the environment and safety.

ANSPs have to deal with new challenges derived by the changes in the airspace regulation and the evolution of their business.

These factors are putting new technologies in the spotlight as enablers through which to provide flexible, scalable and robust solutions in air traffic management.
iTEC is an air traffic management (ATM) system based on aircraft trajectory prediction that allows air traffic to be managed in a safe, fluent and efficient way, offering pilots the possibility to optimize the route to their destination.

iTEC stands for “interoperability Through European Collaboration” and is one of the most advanced ATM today systems around the world. Developed by Indra following the European Flight Data Processing (eFDP) specifications, iTEC is a fundamental step towards the objectives of the Single European Sky program.

Based on Indra experience in ATM systems and IT technology, "iTEC Cloud" intends to provide the answer to the coming demand of Software as a Service (SaaS), sometimes referred to as "on-demand software", for air traffic management.

iTEC Cloud is based on the iTEC Suite software, and includes all its functional and architectural features. It is a software delivery method in which the iTEC Suite applications are hosted by a service provider and made available to customers over a network as Web-based services. Using a modular design, iTEC Cloud allows selecting “on-demand” the capabilities (or services) required by each specific ATM domain.

iTEC Cloud will rely on the following key architectural principles:

- The software layer is completely independent of supporting hardware and facilities.
- Operational and technical users work with thin clients, which may be located in remote facilities as all processing is performed in centralized servers.
An iTEC solution tailored to each business reality

The flexibility, scalability, and high availability features supported by iTEC Cloud enable different possibilities in providing ATM services to potential customers, based on the Software as a Service (SaaS) approach:

- Using customer owned infrastructure and facilities (internal Cloud). The customer needs to acquire software and hardware infrastructure necessary to provide internally the required operational services.
- Using third party facilities. Housing the iTEC Suite virtualized software in the infrastructure of a third party as required by the customer.
- Using Indra’s cloud hosting facilities to provide a complete set of services combining the capabilities in infrastructure and managed services (Indra Flex-IT Suite).
- A combination of the above to cope with spikes in capacity due to seasonality and business continuity/disaster recovery plans.

These sales models offer a global business experience that encompasses the deployment and operation of the ATM solution so that customers can concentrate on their core business.

Benefits through iTEC Cloud

The iTEC Cloud service offers customers a highly tailored solution that delivers a series of advantages through cloud computing:

- Services based on demand.
- Flexible pricing model.
- Resources pooling among customers.
- Service monitoring.
- Fully delocalized infrastructure resources.
- More economic use of hardware resources.
- Dynamic provisioning
- Guaranteed safety and security

All these factors allow ANSPs to optimize the operational costs and simplify maintenance and support while ensuring full compliance with current regulations.

A new concept targeted to provide the right answer to the new challenges

The iTEC Cloud concept opens up new business opportunities in the ATM market, including:

- Providing infrastructure solutions to ANSPs willing to deploy and use an ‘internal Cloud’, supporting various IT services.
- Developing an ‘iTEC Cloud’ to provide iTEC Suite software-based services to consortiums applying to the services defined by EUROCONTROL as Centralized Services.
- Providing services based on iTEC Suite software to ANSPs, Airports, Airlines, and all other entities requiring such solutions.
Indra Air Traffic Management (ATM) solutions

Indra is an experienced supplier of Air Traffic Management solutions including automation systems, surveillance, communication systems and navigation aids, compliant with the most demanding worldwide safety regulations.

iTEC Suite is a state-of-the-art ATM automation system developed by Indra, which meets the standards and practices established by the International Civil Air Organization (ICAO) and EUROCONTROL.

Smart and reliable systems in an increasingly complex environment

The main challenge of Air Navigation Service Providers is to maintain the safety of the aircraft flying through their airspace whilst allowing them to be efficient, profitable and environmentally friendly in a very demanding context of increasing traffic levels. These challenges can only be met through cutting-edge technologies that are able to satisfy the current and future needs of our customers.

Through the iTEC Suite, Indra offers state-of-the-art systems compliant with international standards and aiming to improve safety, productivity and individual flight efficiency by supporting trajectory-based operations and global interoperability, and providing controllers with aircraft trajectory prediction, free-routing, conflict-free plans and an increased reliance on airborne and ground based automated support tools.

Indra offers modern solutions to the ATM industry enabling the provision of better services to air traffic users.

Worldwide experience

Indra has developed air traffic management systems that are deployed across the world, with over 4,000 installations in 160 countries.

Indra is positioned as the market’s leading supplier of air traffic management and communications, navigation and surveillance (ATM-CNS) systems. In the field of R&D, Indra is one of the leading companies in the SESAR program, the key technology behind the Single European Sky initiative. Indra is also the technology partner of many major European navigation service providers, including ENAIRE, NATS, DFS and EUROCONTROL.

Indra continues consolidating its position in Latin America and Asia-Pacific, where its Air Traffic Control Automation systems are used to manage the upper airspace of Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Belize. Other Indra’s ATM systems, such as communications, navigation and surveillance systems, have also been deployed in their control centers. In addition, Indra has developed projects in Colombia, Ecuador, Argentina, Chile, Peru, Uruguay, Paraguay and Brazil, among others.

In the Asia-Pacific region, Indra has deployed a network of radars in China, that will provide air traffic surveillance in 60% of the country’s airspace. The need for surveillance systems in India and Indonesia is mainly covered using Indra’s solutions. Additionally, Indra is carrying out major projects, including the deployment of a radar network in Australia, that will provide coverage for the country’s entire east coast.

The leading global supplier of flight data processing solutions

With services that include automation and simulation tools, Indra has over 300 installations worldwide, and the self-confidence required for managing the most congested and complex airspaces around the globe, such as routes in Europe.

Indra’s control and coordination systems are developed specially for civil and military air traffic control applications. Their architecture and the great reliability of Indra’s communication systems are designed to easily adapt to client needs within the air traffic management environment.
AUTOMATION AND SIMULATION
Indra's Air Traffic Control Automation systems are the result of over 95+ years of experience in ATM products installed worldwide, and are recognized as the most advanced integrated solution for end-to-end flight plan management and 4D-trajectory calculation.

COMMUNICATION SYSTEMS
Indra’s Voice Communications Control System (VCCS) provides interoperability and connectivity to existing communication infrastructures as well as Ground-Ground and Air-Ground. Air voice communication networks, managing analogue and digital signaling methods together with state-of-the-art VoIP capability.

High reliability

95+ years of experience in ATM products installed worldwide

SURVEILLANCE
Indra’s surveillance solutions enhance air traffic safety and efficiency by providing our customers with advanced and reliable surveillance systems composed of modern and proven sensors with consistent integration platforms.

NAVIGATION AIDS
Indra offers a complete range of navigation products, which include the latest generation of ILS, DME, DVOR and GBAS systems.

Over 400 surveillance systems supplied

Over 100,000,000 safe landings
WORLDWIDE

Indra has developed air traffic management systems that are deployed across the world, with over 4,000 installations in 160 countries.

With a presence on all five continents

Main references
Spain
Netherlands
Germany
United Kingdom
Norway
China
Peru
Poland
Oman
Australia
Brazil
Argentina
Chile
Colombia
Costa Rica
El Salvador
Guatemala
Honduras
Nicaragua
Belize
Ecuador
Uruguay
Paraguay
Indra is the leading consulting and technology multinational in Spain and Latin America. It provides solutions and services for the Transport and Traffic, Energy and Industry, Public Administration and Healthcare, Financial Services, Security and Defence and Telecom and Media sectors.

Our vision

As a corporate project, the Indra vision has always been long-term and has been founded upon the firm belief that maintaining a company profile, focused on innovation with a solid technological base and offering premium solutions to leading clients, allows us to generate increased growth and profitability and, thereby, acquire the capacity to create value in the short-, medium- and long-term.

In 2004, following a period of consultation and feedback with company professionals, we defined our vision as follows:

“To be an innovative knowledge-based company in our relations with internal and external stakeholders (shareholders, professionals, clients, etc.), with the institutions that cultivate and develop this knowledge, and with the communities in which we operate.”