2 Air Navigation
Development and evolution of air traffic

The Directorate of Air Navigation’s mission is “to provide safe, quality, efficient and green air navigation services to fulfil the needs of customers and of society, focusing on the development and satisfaction of our people and on the development of air transportation.”

The total volume of air traffic in Spain was still growing in 2011, achieving slightly better figures thanks to a small improvement in the Spanish GDP and despite the international financial crisis. Accordingly, the total activity amounted to 1,953,589 (total number of flights), a 3.34% increase from 2010.

Spain ranks fourth in Europe in air traffic numbers, with a 3.7% increase in the number of IFR movements, a little better than the average European country. The greatest increase in IFR traffic was in the Canary Islands, which grew by a remarkable 8.3% in 2011, compared to a 3.8% increase in the Spanish Peninsula FIR.
During 2011 the percentage increased in IFR traffic surpassed expectations due to foreign tourism, especially in terms of inbound and outbound flights. However, the increase was less pronounced in overflights during the North African crisis because of the so called “Arab Spring”. In contrast, domestic flights followed a downward trend.

Monthly traffic was positive since the beginning of the winter campaign. Sharp increases in year-to-date figures in April and December were caused by the traffic volumes plummeting during those two months in 2010.

IN 2011 the percentage increase in traffic surpassed expectations due to foreign tourism.
The following chart shows the volume of operations in Spain in 2011 and year-to-date growth:

<table>
<thead>
<tr>
<th>Volume of FIR air traffic in 2011 and 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
</tr>
<tr>
<td>FIR SPAIN</td>
</tr>
<tr>
<td>FIR PENINSULA</td>
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<tr>
<td>FIR/ACC CANARIES</td>
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International legal framework for air navigation

New SES legal framework

In 2004, the European Union launched the Single European Sky initiative, or SES, designed to achieve an effective air transportation system based on the development and execution of common transportation policies, and taking a set of measures, namely, the harmonization and the improvement in the provision of air navigation services in Europe, reorganizing airspace according to air traffic, not to national borders, and reinforcing safety levels across Europe.

The rules and regulations of the Single European Sky are applicable to every European Union member State such that when the initiative is enacted, its stipulations will be automatically binding through the National Supervisory Authorities, which ensure the supervision and application of the legislation.
The passing of Community Regulation (EC) No. 176/2011 sets the requirements regarding the preliminary information Member States must submit to the Commission, to the European Agency for Air Safety (EAAS), to other Member States, and to all interested parties, for the establishment and modification of a Functional Airspace Block.

EUROPEAN PERFORMANCE SYSTEM

The evaluation system for air navigation services performance and network functions in key areas (safety, environment, capability and profitability) in air traffic in EU, AFI, ICAO regions, in which, according to Community Regulation (EC) No. 691/2010, Member States are responsible for the provision of air navigation services, was amended by the following regulations:

- **Community Regulation (EC) No. 1216/2011**: presents the Key Performance Indicators (KPI) for operational safety.
- **Community Regulation (EC) No. 1034/2011 and (EC) No. 1035/2011**: regarding the supervision of management air traffic safety and air traffic services, the passing of these regulations allowed for the introduction of new competencies for the European Aviation Safety Agency (EASA) without modifying the existing requirements applicable to air navigation service providers.

Aena, in its role as a provider of air navigation services, for the assessment of its performance, shall provide, among others, economic data, annual financial statements and the chapter of its annual company planning devoted to performance indicators.

FUNCTIONAL AIRSPACE BLOCKS (FAB)

The consolidated process to establish the Functional Airspace Blocks (FAB) based on operational requirements, independent from national boundaries, as an essential measure to improve the efficiency of the European network, and to reduce the current fragmented provision of air traffic services sets December 4th, 2012, as the deadline for the completion of its set-up and, particularly, that of the SW FAB - **South-West-FAB** - developed between Spain and Portugal (Southwestern Europe Functional Airspace Block).
Likewise, Aena shall comply with the performance objectives set in the National Performance Plans, the contents of which shall be a major influence in every area of activity of this Directorate.

AIR TRAFFIC CONTROLLERS

Community Regulation (EC) No. 805/2011 is the highest ranking law regarding the issue of licences in the European Union. Its passing established the regulations for the issue, suspension and revocation of air traffic controller and air traffic controller student licences, authorizations, notes and medical certificates, training organization certificates, and the conditions for their validity, renewal and use.

NETWORK MANAGER

The volcanic crisis of April 2010 evidenced the need for a central entity capable of managing future crisis, with resources, experts and operations under a Network Manager created under the provisions of the SES.

The passing of Community Regulation (EC) No. 677/2011 allowed for the following:

- Enforceable provisions on the functions of the air traffic network management (ATM) aimed to optimise the use of airspace in the Single European Sky, and to guarantee airspace users a choice among the preferred air paths while allowing them full access to the airspace and to air navigation services.

- The creation of the Network Manager, an independent and impartial entity to carry out European route network design functions, coordination of available resources, (i.e. Radio frequencies in aeronautical frequency bands used by general air traffic and SSR transponder codes) and the European traffic flow management (ATFM).

In order to fulfil his duties, the Network Manager is to develop, maintain, and implement the network’s strategic and operation plans. Likewise, the Network Manager is to create a Network Management Board (NMB) to adopt measures intended to manage network functions and supervise their implementation.
Aena, whose procedures will have to be significantly modified due to the establishment of this entity, shall:

- Make sure domestic and European network improvements are consistent with the contents of the network operations plan.
- Guarantee, as the air navigation service provider, that its operations plans match the network operation plan and its updates.
- Assess the impact, taking the necessary measures in this regard, of the exercise of the ATFM function by the Network Manager over the Airspace Management Cell (AMC Spain), a military and civil unit that assigns airspace time (on a pre-tactical phase) based on user requests (ACC, FMP, management units for military zones and other certified agencies).

Additionally, the following EU Regulations came into effect during 2011:

- **Community Regulation (EC) No. 283/2011** amended Regulation (EC) No 633/2007 laying down requirements for the application of a flight message transfer protocol used for the purpose of notification, coordination and transfer of flights between air traffic control units.
- **Community Regulation (EC) No. 1206/2011** laying down requirements on aircraft identification for surveillance for the single European sky (ACID).
- **Community Regulation (EC) No. 1207/2011** laying down requirements for the performance and the interoperability of surveillance for the single European sky (SPI).
- **Community Specification ETSI-EN-303 214** on data link services (DLS, Data Link Services).
Evolution of Spain’s legal and policy framework

The entry into force of the EU’s legislation on the Single European Sky led to changes in domestic legislation, not only with the passing of new rules affecting air navigation, but also by amending existing rules. Over the course of 2010 Spain’s legal and policy framework was thoroughly revised so as to align the domestic system with that developed in 2011.

GENERAL FRAMEWORK

Regulation of provision of air navigation services. The publication of Law 9/2010 of April 14th establishes a new general activity framework for air navigation in Spain via:

- **Liberalisation measures**: opening the entrance to new civil air traffic service providers for aerodromes, certified and nominated by competent authorities, together with the provision of apron services by non-controller personnel, and the implementation of flight information systems (AFIS) in aerodromes.

- **Guarantee** of safe, efficient, continuous, and economically sustainable provision of air traffic services by any ATS provider.

- **Economic measures**: Aimed to add aerodrome air traffic services costs to those of the airport manager, and to reduce route tariffs down to the average of the five main European service providers by 2013.

- **Reorganization of controllers’ working conditions**: Ensuring the availability of required personnel to provide services under the new regulatory framework.

Control tower Vitoria airport
INSTITUTIONAL FRAMEWORK

New management model for Aena

- Order FOM/1525/2011 of June 7th resolves the start of effective exercise of airport management functions and duties by Aena Aeropuertos, S.A., coming into effect on June 8th; from then on, the Public Business Entity Aena ceases to perform airport management activities.

- The Directorate of Air Navigation (DNA) is to cooperate and coordinate with Aena Aeropuertos, S.A. on every matter involving the management and exploitation of airport services under their responsibility, and any other vested upon the airport manager by domestic or international legislation regarding the airport and heliport network operated by Aena.

- Royal Decree-Law 11/2011 of August 26th, creating the Airport Economic Regulation Commission as a regulating body of the air transportation services industry as regards airport fees, aiming to maintain objectivity, nondiscrimination, efficiency and transparency of the system used to set and review airport fees.

- Royal Decree 30/2011 of January 14th, develops the basic organizational structure of the Ministry of Public Works. The Civil Aviation Directorate designs and manages aeronautical policies on civil aviation, within the competencies of the Central Government. Main implications for DNA: to comply with aviation bulletins, take part in work groups, seminars, forums and activities organized by DGAC; provide aeronautical authorities with the required information or support.

FRAMEWORK OF AIR NAVIGATION HUMAN RESOURCES

During 2011 the following regulations regarding Aena staff were passed:

- Resolution March 7th, 2011, of the Dirección General de Trabajo, recorded and published the arbiter's ruling establishing the 2nd Air traffic controller collective bargaining agreement in the public corporate entity Aena.

- Royal Decree-Law 11/2011 of August, 26th establishes that the collective bargaining, recruitment and legal status of non air traffic controller staff in the public corporate entity Aena shall be that established for Aena Aeropuertos, S.A. personnel.

- Resolution of October 11th, 2011 of the National Aviation Safety Agency (AESA) provides that prior to January 15th, 2012, AESA shall require, ex officio, the licences, ratings and annotations of civil air traffic controllers to be exchanged as a result of Royal Decree 1516 / 2009 of October 2nd, which regulates the Community air traffic controller licence.

- Resolution of November 29th, 2011, of the General Directorate of Labour, which recorded and published the first collective bargaining agreement for the Aena group of companies (Public Corporate Entity Aena and Aena Aeropuertos, SA).
FRAMEWORK FOR OPERATIONS AND SYSTEMS

Royal Decree 1238/2011 of September 8th, which regulates airport apron management services and the conditions for their implementation, in order to ensure the safe operation of aircraft in their movements in airport aprons, requires the DNA to publish the availability of said service prior to its implementation date in the Aeronautical Information Publication (AIP) of the Aeronautical Information Service (AIS).

EXCEPTIONAL SITUATIONS

The publication of Royal Decree 28/2011 of January 14th repealed Royal Decree 1611/2010 of December 3rd, which temporarily commended the Ministry of Defence with the exercise of the Public Corporate Entity Aena’s air traffic control duties, thus giving every competency involving air traffic control back to the company.

AERONAUTICAL INFRASTRUCTURES

Royal Decree 1189/2011 of August 19th regulates the procedure for the issuance of compatibility reports and certificates (referred to in Law 21/2003 on Air Safety) prior to the establishment, modification and opening to traffic of airfields of regional competency, and prior to the adoption of plans for regional airport facilities.

The scope of application of the Royal Decree is restricted to public-use airports managed by regional governments, meaning that general interest State-owned airports are not included and its provisions do not affect the Aena airport network. However, the Directorate of Air Navigation could be indirectly affected as the air navigation services provider (ATS and CNS) at airports owned by regional governments on the basis of the contractual relationships established with the managers of these airfields.
Development and deployment of the European air navigation system.

One of the main European level programs Air Navigation is playing a remarkable role in is SESAR (SES ATM Research), a key community initiative to provide the air traffic management system with the tools required to handle traffic forecasts for the coming years, as scheduled in the ATM Master Plan.

Aena participates in the SESAR Joint Undertaking (SJU), formed by the main players in the European ATM system, to ensure the future of the system defined by the SESAR program. The SJU will coordinate and fund the research, development, and validation tasks contained in the ATM Master Plan, so between 2016 and 2020 and after the industrialization process, the operational solutions and their technical facilitators will be gradually phased in.

During 2011, technical and economic monitoring of Aena’s participation in the development phase of the SESAR program was carried out. The validation activity planned for 2011 concluded on schedule and the objectives were achieved. It was the first validation exercise involving Aena within the SJU work program framework, and involved the introduction of P-RNAV in Madrid TMA and its participation in the design of the 2012 Plan, which includes the set of validation exercises in which Aena will take part in 2012.

In the context of SJU development activities, of note are the launch of the campaign to update the ATM Master Plan, the partnership between Aena and Airbus within the SJU work program, and the management of the airports work package (WP6), in coordination with Aena Aeropuertos S.A.

The SESAR program will provide the air traffic management system with traffic forecast tools for years to come.
The year 2011 was marked by the vision of air navigation set by the Government, and the organization it aims to achieve in the medium term: “being leaders in the provision of safe and quality aviation services in a global and competitive environment, valued by customers and society. In particular, achieving excellence as an organization and having highly qualified, committed and satisfied people.”

Being aware as we are of the difficult global situation affecting customers, all our efforts are focused on strengthening the safety of services, improving their quality, and increasing economic efficiency.

Within the new legislative framework defined for 2010 and 2011, and after a long series of actions associated with these reforms, there has been a series of performance indicators, some of which are part of the 2012-2014 PNER (National Performance Assessment Plan) and compulsory as stated in Community Regulation (EC) No 691/2010.
The results in every European-wide performance area are as follows:

**COST-EFFICIENCY**

**Gate - to - Gate**: ATM/CNS total cost per compounded hour 1 in 2011 was €492, 5% better than in 2010 and than the goal set in the 2011 Operations Plan.

**Route**: During 2011 ATM/CNS costs for route indicator was monitored, reaching a lower value of €59 (the goal for 2011 was €63).

**PRODUCTIVITY**

The value of global productivity achieved in 2011 outperformed the goal set and improved on the figure for 2010, as a result of the implementation of the following measures:

- Substantial variation of working conditions. (Changes in schedules)
- Downsizing control rooms during night hours
- Optimization of supervisor allocation
- Optimization of on-the-job training processes

**AIR NAVIGATION SERVICES SECURITY**

**Weighted Security Level**: This measure integrates the monitoring of the evolution of type A and B ATM-caused incidents per 100,000 hours of controlled flight. Its value in 2011 remained below the goal level set.

**Safety maturity index**: this indicator monitors the implementation of safety management systems, based on the score obtained by the organization in various working areas. In 2011, it reached 65.74 points, improving on 2010’s results (62.95) and surpassing 2011’s goal of 64 points.

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1 European level indicator comparing the financial efficiency of air navigation service providers considering both en route, approach and airport services (source ACE – ATM Cost-Efficiency Report).
Please note the fact that the implementation of the reduction of minimum radar separation in September 2011 helped decrease the number of incidents due to loss of lateral separation.

**CAPACITY**

**En route delays:** During 2011 its level fell 8% from 2010, due to a greater availability of sectors stemming from the implementation of measures listed in the productivity section. The capacity of certain sectors and their possible cluster values also increased.

Summer 2011: Despite the measures implemented to increase productivity, the loss of workforce due to higher absenteeism and to provide child care did not reduce the delay rate to the established goal.

**Load factor for ACC sectors:** Optimization measures improved the values of the ACC load factor.

**ENVIRONMENT**

Main projects during 2011:

**CDA:** In order to implement operations allowing more efficient flying profiles for aircraft, phase 2 was completed, adding continuous descent procedures at low/medium density traffic airports during its operation period. CO₂ and noise pollution were reduced in overflown areas, thus complying with the target to reduce emissions of pollutants.

**FUA:** many initiatives to reorganize airspace were carried out by re-classifying airways (conditional use), establishing new and more direct routes, new input and output procedures at different airports, etcetera. All these measures were designed to reduce the number of miles flown and to achieve a significant reduction in CO₂ emissions.
Main actions

Economic resources

The strategy of improving our services with the ultimate goal of offering greater efficiency to customers is based on the development of various programs of action in areas related to these services. The influence of the 2010-2013 Government Austerity Plan in the execution of these programs is reflected in the investment, incomes and expense budget incurred in 2011:

- **Investments**: EUR 133.19 million
- **Incomes**: EUR 1,253.69 million
- **Expenses**: EUR 969.32 million

The main actions carried out by the Directorate of Air Navigation to improve our services and achieve the performance indicators proposed are as follows:

**Organization and management of airspace service**

This service consists of structuring, planning and managing the use of the airspace and understanding the rules and operating procedures so as to ensure access to air space depending on users’ requirements.

So as to attain the highest level of quality in the service provided, the year 2011 saw work continue to optimize the network of routes and ATC sectorization in an effort to improve the effectiveness and efficiency of the system.
In 2011 we completed work to provide contingency instrument departures in the Balearic and Canary Islands airports; some manoeuvres and procedures at various airports of the network were modified, and actions aimed to improve cut-off levels among ACC Madrid sectors and to group ACC Barcelona sectors were carried out. Many projects that will be released during the first half of 2012, such as the deployment of airways of the East and Balearic TMA; a new instrument procedure design for inter-island traffic in the Balearic Islands; the new airspace design for the commissioning of the second runway of the Malaga-Costa del Sol Airport; the expansion of the Galicia TMA; and the implementation of contingency instrument departures for the airports of the Barcelona TMA, the Valencia TMA, the Seville TMA, and the Galicia TMA and for the Bilbao airport.

Studies were initiated to optimize the Valencia and the Canary Islands TMA sectors, to design and create new direct night routes and to introduce the FreeRoute as SW-FAB projects.

Efforts to introduce precision (PRNAV) Air Navigation in the TMAs and in associated departure and terminal arrival procedures (SIDs/STARs) continued, so that aircraft can fly any path without restrictions. To this end, in 2011 design work for the Madrid and Barcelona TMA continued, and required activities for the implementation of P-RNAV GNSS-based manoeuvres were carried out.

**CAELUS Program:** within the framework of the new ANSP legislation applicable in Spain, Law 9/2010 and RDL 13/2010 determine the deregulation of air traffic control services at aerodromes within the road map established by the Single European Sky (SES). It is necessary to carry out an airspace restructuring program in order to facilitate the achievement of the objectives set out by this regulation and to allow progress in the evolution of NA as the air traffic services provider in this new environment, the goal being to remodel control towers to allow them to become more efficient and competitive. Most of the tasks
planned for 2011 had to be rescheduled since the necessary studies to design the route airspace and TMA will not be completed until March 2012.

Air Navigation continues to pursue the strategy of commitment toward the environment through different projects to minimize the impact of its services. Starting with Asturias and Santander, which were the first to use daytime green landings, in 2011 the second phase to implement operations with Continuous Descent Approach (CDA) ended. The continuous descent procedures allow more efficient aircraft flights according to profiles, and thus reduce pollution from CO₂ and noise emissions. In addition, civil/military coordination, within the project FUA (Flexible Use of Airspace), for the joint use of airspace continued, in order to introduce procedures to allow real-time shared airspace management. Phase 2 was completed in 2011: the re-sizing of southern military zones, the commissioning of new SID and STAR procedures in the Seville, Jerez and Almeria airports, and the creation of new airways and the authorization for the conditional use of others.

All these actions demanded an extraordinary workload, necessary to carry out the numerous previous studies, the development of different analysis tools, and the final operational validation of every project related to airspace management.

Capacity / demand management service

This service maximizes the relationship between system capacities and air traffic demand, maximizing the use of the available capacity (maximum number of aircraft movements / operations entering a control area, overflying a certain point and taking off or landing at an airport or a group of airports per hour) to ensure an optimum flow of air traffic and comply with the objectives of maximum safety, without disrupting the operation, the economy or the environment under normal conditions.

During 2011, the Directorate of Air Navigation continued working on a modular zoning easily adaptable in real time, in order to improve the capacity offered to traffic flows. This modular partition is being developed within the scope of the iTEC-FDP project, which sets predefined functional volumes (FV) that should allow for defining ACC sectors (grouping, combining or subdividing) to deal with different situations and workloads.

Determining the capacity is essential for the optimization of the Air Navigation system; in this regard, the development and evolution of multiple internal CNS/ATM analysis tools required by the service continued in 2011.
With this service, Air Navigation orders and sequences air traffic by providing the necessary separation between aircraft and between these and all obstacles. Air Navigation provides useful advice and information for in-flight aircraft operations. It also notifies and assists relevant agencies regarding aircraft in need of help and rescue.

The technological development and automation of the Air Navigation system led to the creation of the Automated Air Traffic Control System (SACTA). Its evolution continued during 2011, when the two major milestones were the commissioning of the Short-Term Conflict Alert (STCA) implemented in all TMAs and the DMAN functionality validation (management of delayed departures) of SACTA version 3.Z5.10, now available for use in the Barcelona and Madrid-Barajas TWRs.

By March, all ACCs had transitioned to SACTA version 3.Z5.17, which features the latest in dynamic simulation.

During 2011 the new values for Minimum Separation Radar Distance (MSR): 5NM en route and 3 NM in TMA were published in the AIP and placed in service (September 22nd, 2011).
New towers in Fuerteventura (02/18/11), Santiago (09/20/11) and Tenerife North (11/23/11) entered service in 2011.

The close partnership between the Directorate of Air Navigation and the Directorate of Spanish Airports has produced a program that seeks to integrate the airport and ATM networks, thus maximizing the existing infrastructures. To this end, they have taken part in several projects: the A-CDM (Advanced Collaborative Decision Making) project which included the signing in 2011 of the MoU (Memorandum of Understanding) of Madrid-Barajas Airport and the parties involved in the participation of Eurocontrol and the DMAN (Departure Manager) project, aiming to enhance take-off sequences so as to maximize runway performance and minimize delays.

**Air Navigation Information Service (AIS)**

The Air Navigation service, provided by the Directorate of Air Navigation, ensures the process, management and user access to all relevant updated and validated aeronautical information needed for its operation. The AIS provides the aeronautical information necessary to perform all air operations safely, regularly and efficiently. All that information is published and distributed from central Air Navigation services.
During 2011, further progress was made in the transition towards an aeronautical information service model based on digital information services, and in the adaptation of processes to new domestic and SES regulations.

Among the various projects under way, worthy of mention is the NOTAM digital project (evolution of the current NOTAM system in Europe). In 2011 the new EURONOTAM tool was tested by successfully connecting it directly to Aena’s system, Icarus XXI. The service was declared operational prior to the publication of the new GPS-EGNOS NOTAM manoeuvres in Spain, scheduled for mid-2012.

Another Air Navigation system constantly evolving is Icarus (Integrated AIS/COM/AIP & Reporting Office Automated System), which provides different services to the aeronautical user: management of aeronautical information, NOTAM, preflight information bulletins, weather information and the submission of flight plan messages. Over the course of 2011, Icarus was installed as part of the working tools at the AFIS airports in La Gomera, El Hierro, Burgos and Huesca-Pirineos.

In keeping with the effort to develop Air Navigation systems, we expanded the capabilities of the INSIGNIA system (geographic information for the aeronautical information system), a system for the production of Visual charts. In addition, the process of entering and updating data is already fully implemented as evidenced by the generation of AIP VAC charts from the AIRAC AMDT database of 06/11 July. Also prepared was the system and procedures for loading data from SID and STAR procedures and for loading airfield data, which is already completed for the airports of Valencia and Huesca-Pirineos.

Finally, in the area of aeronautical information publications, continuously updated information was provided with the publication of new instrumental procedures due to the radio navigation aid service cancellations and contingency departures in some airports, and new chart calculation programs.
CNS Service (Communications, Navigation and Surveillance)

This service guarantees the availability, operation and maintenance of the technical resources and facilities required for the Air Navigation system supporting aircraft operations.

COMMUNICATIONS

Aeronautical communications represents a core value underpinning air traffic service. In the Air-Land (T/A) version, which services pilot-controller communications, the strategic project is reducing the bandwidth of pilot-land voice communications from 25 to 8.33 kHz to increase the number of potential radio frequencies. Although there is no shortage in Spain, the critical situation in other EU countries has propelled a mandatory solution over FL195. The measure has proved successful, and will soon cover all flight levels after the amendment of current regulations, which will require certain preliminaries from every interested party. During 2011, new T/A communications equipment went into service at the Fuerteventura, Santiago and Tenerife North airports, at the main receiving center of the Malaga-Costa del Sol airport, for new route frequencies and ACC-Brest in the Asturias TWR and at the Burgos and Huesca-Pirineos AFIS airports.

The Voice Communications System, closely related to air traffic service (SCV), is in the process of being updated and adapted to international standards so that it can work with IP and VoIP protocols (Voice over IP). During 2011 and together with this future development, version 1.10.3.22 of SCV IPin Madrid (09/11/2011) and Barcelona (02/12/2011), were updated and standardized. The lvoice recording and playing system in the ACC-TMA/Madrid was refurbished and new SCV and digital recording systems were installed in the new control towers of Fuerteventura, Santiago and Tenerife North.
Air Navigation has its own communications network for Land-Land to enable data exchange among different systems, at a domestic and international level among different ANSPs (Air Navigation Service Provider). During 2011, Air Navigation extended the presence of its network in its new facilities, with the entry into service of new operational nodes in the new control towers of Fuerteventura, Santiago and Tenerife North. Simultaneously, several Land-Land communications links were deployed: in 2011, the radiolink between Taborno and the Tenerife North tower entered service and the installation of fibre optic rings in Fuerteventura, Santiago, Tenerife North and Málaga was completed.

Also worth noting is the implementation of round-the-clock operations for the EURONOTAM aviation messaging tool.

**NAVIGATION**

Air Navigation is deploying radio navigation aids (to enhance aircraft guidance) in line with the introduction of new technologies and navigation applications, intended to improve service levels while reducing equipment and maintenance costs as much as possible. To this end, in 2011 seven NDB (Non-Directional Beacon) were removed and several VOR/DME (VHF Omnidirectional Range/Distance Measurement Equipment) were either upgraded or replaced. Moreover, the ILS/DME (Instrumental Landing System) at Murcia-San Javier (runway 23) and Malaga-Costa del Sol (runways 13 and 31) were also replaced, and new ILS/DME were installed in Malaga-Costa del Sol (runway 12) and Logroño (runway 29). Two GP/DME were also moved in order to comply with the requirements of Annex 14, and the Tenerife North (runway 12) and Alicante (runway 10) were modified.
In parallel, during 2011 the new control towers were supplied with control and monitoring equipment and the SIRA system and EC Safety and Verification studies on radar and radio navigation aids were carried out.

Regarding satellite navigation, during 2011 several activities were carried out intended to enable the entry into service of performance-based flight procedures that allow aircraft operations in instrument flight conditions using only onboard equipment, and which in the near future will enable the design and entry in service of new procedures independent of the existence of radio navigation aids.

The future satellite navigation system, EGNOS, was tested in flight in different airports. Thanks to this system, the pilot will be able to perform instrument approaches at any airport without the need for land-based radio navigation aids, a breakthrough in safety and operability.

SURVEILLANCE

Surveillance systems for Air Navigation, necessary to ensure the safety of air traffic by identifying and tracking all aircraft flight paths, has expanded and improved in its radar coverage. In particular, six Mode-S MSSR units are being updated and a new Mode-S radar is being delivered. A new approach radar (primary and secondary) at the Gran Canaria airport entered service in November.

Aligned with efforts to evolve airport surface surveillance, Air Navigation completed the installation of surface radars (SMR) in Asturias, Barcelona and Santiago de Compostela. At the same time, the installation
of an SMR at the Bilbao airport and Mode-S (SMMS) multilateration systems in Barcelona-El Prat and Málaga-Costa del Sol is still under way.

The Directorate of Air Navigation is engaged in advanced aeronautical systems research, featuring in 2011 the implementation of SACCAN phase 3, implemented by ADS-C (Automatic Dependant Surveillance – Contract) and CPDLC (Controller Pilot Data Link Communication) in the Canary Islands FIR. This included tests performed on the new SAC-CAN v2 system. Also of note is the completion of the OPTIMI project, which uses ADS-C to analyse aircraft tracking improvements in ocean areas.

TECHNICAL OPERATIONS

Among the different tasks carried out throughout 2011 intended to improve and update Air Navigation infrastructures, the most significant are the completion of the expansion of the secondary radar equipment room in Taborno (Tenerife) and the improvement of NA electrical installation in category II and III airports.

Likewise, the NOF was moved to the central systems building of the Madrid AAC, and work on the new logistic support center building in Paracuellos del Jarama was completed, although the items corresponding to the connection and access to the public sewerage system are still outstanding.

In 2011, technical operations required a considerable effort in terms of the documentation generated. This was because of the creation of Aena Aeropuertos S.A. and the need to reach agreements between Aena and Aena Aeropuertos S.A. to provide services, co-ordination, maintenance, etc.

As the entire Air Navigation is included in the CNS/ATM systems area of activity, here are the main generic activities executed during 2011:

- Central logistic support to SNA facilities.
- NA system maintenance by Regional Units, as per established methods and procedures.
- Operation and maintenance of Air Navigation Systems (REDAN, CRAMI, VOLMET, ICARO XXI, RECON, COS, SACTA, etc.), some of which are centralized.

Besides, special mention must be made of the compliance of inflight calibration planning of Air Navigation facilities during 2011, thanks to the combined use of Calibration Units of the CECAG, Spanish Air Force, the Aena Internacional's Inflight Verification Unit and the CFI (Cobham Flight Inspection) External Unit through current contracts with those companies. Also worth noting is the fact that Aena Internacional's Inflight Verification Unit 750-flight-hour commitment reached 800.67 hours. Finally we note the high levels of availability and continuity of Air Navigation services achieved in the operation of the CNS/ATM system, with both systems attaining rates of 99% in 2011.
Management excellence

One of the Directorate of Air Navigation commitments is achieving management excellence, that is to say, applying a set of outstanding practices in the management of the organization.

A great number of activities were carried out in an effort to achieve management excellence:

OPERATIONAL SAFETY

Safety is the raison d’être of the services provided by Air Navigation, an essential component of every project of the DNA and a strategic line on its own. To achieve one of Air Navigation’s key goals while keeping the highest safety levels in DNA services, three safety indicators intended to measure its compliance were established in 2011.

To develop these goals a five-year plan was devised for each goal:

• Regarding the safety maturity Indicator, a Maturity Indicator Action Plan was developed with activities and designated managers, the objective being to raise both the score and the maturity level.

• Regarding the action plan to decrease the weighted safety level (NPS), the main contributions to the overall NPS and possible ways for reducing them were analysed:

  » Main contributions to the NPS were violation of minimum separation between control centers and LEMD. LECM is the priority, followed by LECB and LEMD, and finally, LECL, LECS, GCCC and LECP.

  » Actions to be carried out for the implementation of Safety Nets are underway, like control staff training in the most critical sectors in procedures to avoid or mitigate the main factors detected in incidents, EMA operator coordination to reduce aircraft non-compliances and evaluation of certain procedures to see if they can be implemented in aircraft.
PHYSICAL SECURITY

Within the scope of Air Navigation Physical Security management, there was non-stop work to complete the implementation of physical security (PS) programs in the Directorate of Navigation Services facilities, carrying out a global and detailed diagnosis of the real and objective situation of the physical security of every facility or unit providing AN services. An essential part of this diagnosis is assessing risk levels based on the criticality and vulnerability of the facility.

QUALITY

As part of its commitment towards constant improvement in service quality, the Directorate of Air Navigation maintained its UNE - EN - ISO 9001: 2008 quality management system (QMS) certification following the AENOR regular audit conducted between April 25 and May 13, 2011.

The integration of the Directorate of Air Navigation’s Quality, Environmental, Physical Security and Operational Safety systems into its Integrated Management System has enabled Aena to maintain the SGI-008/2010 Integrated Management System Certificate (Quality and Environment). As part of the GIS optimization, a study guide for the
Air Navigation has a commitment with society: to be environmentally friendly. To achieve this, we have continued to reduce electricity usage in our facilities and have replaced equipment containing regulated gases that deplete the ozone layer.

optimization processes was developed in 2011 to establish the methodology to use.

A fundamental aspect of the improvements made to the quality management system is client communication (questions, suggestions, complaints), which affords us an enhanced awareness of their opinions, and which Air Navigation maintains through different channels: client forums, the OVACNA (Air Navigation Virtual Customer Service Office), internal committees and the electronic headquarters, available on the Web.

- The official forum for airspace users hosted by the Navigation Services Customer Forum will take place on February 29th, 2012.
- The 2011 Perceived Quality Survey was conducted using Air Navigation’s own resources.

- The new customer care procedure adapted to Aena's electronic management was successfully implemented in coordination with the Corporate Directorate and integrated in the Navigation Services external Communication process.

ENVIRONMENT

We have continued our efforts to reduce electricity usage in our facilities, and replaced equipment containing regulated gases that deplete the ozone layer, this proving Aena’s strong commitment and responsibility toward environmental issues. During 2011, the Directorate of Navigation Services maintained its UNE-EN-ISO 14001:2004 Environmental Management System (EMS) certification.

Two key projects are worth mentioning in terms of reducing the environmental impact of services:

- Phase 2 of the CDA project, consisting of the implementation of operations allowing a more efficient flying profile for aircraft, was completed by adding continuous descent procedures in the low/med density traffic airports during their periods of operation.
- At the same time CO₂ and noise pollution were reduced in overflown areas, thus complying with the objective of reducing emissions of pollutants.

Within the scope of the 2010-2011 Quality and Environment Awareness Plan, training on the environmental control procedures of suppliers and contractors was developed and provided, specific environmen-
...tal training was given to technical operating staff and, finally, a video was produced to familiarize the staff with AN’s Management System.

**INFORMATION SYSTEMS:**

Every ICT action was intended to maintain and improve the services provided by the Directorate of Air Navigation.

**Services planning and coordination**

- Consolidation of the Information Systems services of the South DNRNA in AN SSCC.
- Printing resources optimization project through the SAFECOM system.
- Transfer of Information System user services to the new Pegaso City building.
- Implementation of new HP-UX servers and start of UNIX services migration, such as GESTAR, ABACOST, GESTLIN, etc., to the new platform.
- Implementation and start-up of SCOM back office services monitoring system.
- Migration of Internav to a SharePoint Portal Server technology environment.
- Participation in performance and improvement studies involving various applications under development, such as GESIS, SATMA, ETNA, and GESTUR 2005.

- Development of new applications, such as the following:
  - Surveys demanded by different Air Navigation units, ABACOST (Cost-benefit analysis), File_PC (Registration management), CAPREX (Catalog of Suppliers and Files PAPEX), PACES management, Orders and Files, ALMADEX (ACC Norte Center stock management application analysis), SILNA (Stock control CAL of SNA).

**ICT infrastructures and security**

- Security and intrusion project audit.
- Improvement in storage infrastructure safety, performance, and backup, thanks to the implementation of several projects.
- New CPD in the Central Services building in the Torrejón ACC.

**Communications**

- Relocation of the Fuerteventura tower.
- MacroLAN installation in CAL.
- Migration of telephone access to Vodafone, awarded as part of the corporate communications bid.
- Network security improvement through several projects (firewalls, bridges, network segmentation, 802.1x).
- Implementation of the NNMi management tool to monitor the entire Air Navigation communications network.
- Installation of the telephone system and corporate network equipment at the new headquarters in Ciudad Pegaso, reorganization of all related communications links.
AFIS

In 2011 the airports of Burgos (February 10) and Huesca (December 15) were designated as airfield flight information service (AFIS) airports. There facilities, where Aena used to provide an Aerodrome Control Service (ATC-Aerodrome), now feature an AFIS service, provided by an air navigation service provider different from Aena.

CERTIFICATION

On July 7th, 2011, AESA certified Aena as an air traffic controller training organization, including ongoing and unit training and instructor training.

During the year, the 2011 AESA 2011 supervision plan was undertaken for the purpose of maintaining Aena’s certification as an air navigation services provider and as an air traffic controller training organization.

During 2011, the preliminary analysis for certification as a provider of air navigation services started on an internal basis, in preparation for gathering the documentation needed to renew the certificate in 2012.

INTERNATIONAL PARTICIPATION

Due to cross-border air navigation, which extends beyond Europe, it is part of the strategy of the Directorate of Air Navigation to establish agreements and partnerships with other service providers in order to improve performance.

European regulations require Member States to establish, prior to 2012, functional airspace blocks (FABs) based on operational requirements and independent of national borders. The process of organizing the SW (South-West) FAB evolved reasonably well in 2011, considering the institutional situation in Portugal during this period. Late in the year the roadmap for the SW FAB operational projects that will be implemented from 2012 to 2020 was also defined.

Other forums in which the Directorate of Navigation Services actively cooperates and enhances its standing by engaging in increasingly coordinated actions at an international level are the following:

CANSO (World Organization of Civil Air Navigation Service Providers) and ICAO (International Civil Aviation Organization): within the scope of CANSO GLOBAL the development of the global strategy of CANSO and the establishment of the CANSO Office in Latin America were successfully completed. In CANSO Europe Aena actively participated in the position paper for the deployment of SESAR, with the election of Aena as a CANSO representative in the EC’s Group of Experts, tasked with developing a proposal.

On June 22nd, members of the A6 (a group consisting of AN European Service providers taking part in the SESAR program, and SJU members: Aena, NATS, ENAV, DSNA, DFS and NORACON) signed a Memorandum of Cooperation to strengthen participation in SESAR. AENA leads the A6 SJU activities group.

AEFMP (group formed by air navigation service providers from Algeria, Spain, France, Morocco and Portugal) carried out the activities stipulated in the harmonization plan by approving the 2011 work plan and agree-
numerous actions intended to comply with the commitments undertaken with our clients and with society that involved our active participation in European co-operation projects, domestic civil/military cooperation projects like FUA (Flexible Use of AirSpace) and in projects of the Directorate of Air Navigation, like the promotion of economic efficiency. This adaptation will continue throughout 2012 because of its extraordinary importance and magnitude.

Throughout the year, both domestic and European regulators enacted numerous regulations and standards that required a major restructuring in all areas of Navigation Services in order to adapt to them and, consequently, to improve performance. Throughout 2011, there were

ing on technical inter-operability (COM IP and TDM networks, ATM/CNS system certifications) and operational (FPL migration) initiatives, and by participating in the EUROMED II Project.

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