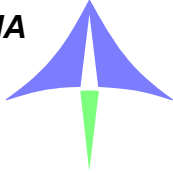


## WITNESS - The New Mentor for Spanish Airspace

**AENA**



The Spanish air traffic control provider – AENA - has used modelling and simulation tools from Lanner Group to investigate how the predicted increase in flight numbers through the country’s airspace, will impact on the efficiency of the services they provide.

Real data from a number of sources was used with Lanner’s WITNESS simulation software to create a computerised model through a Mentor tool, to test a range of scenarios and provide a better understanding of the inter-relationship between flights, schedules, airports and air traffic control sectors. The results have been used to help plan future developments to increase air traffic capacity and reduce the number of delayed flights.



“The insight that WITNESS has given us has been invaluable,” says Francisco Montoto. “It has shown numerous ways of safely improving our flight handling capacity.”

“WITNESS has played a significant role in helping us to plan efficient air traffic control operations for the future,” says Francisco Montoto of AENA.

### Success Leads To Crowded Airspace

The state owned AENA (Aeropuertos Espanoles y Navegacion Aerea), bears responsibility for the maintenance and operation of Spain’s air traffic control system and the country’s 43 largest airports. Safety is paramount but efficiency, value for money and high quality of service, are also very important.

Business and leisure growth has made Spain one of the most popular destinations in Europe. The country’s airports currently handle 141 million passengers, two million aircraft movements and 700,000 tons of cargo a year.

Lanner Group Limited  
The Oaks, Clews Road, Redditch  
Worcestershire, B98 7ST, U.K.  
Phone: +44 (0) 1527 403400  
Email: info@lanner.co.uk

[www.lanner.com](http://www.lanner.com)

<b>Company</b>	• Aena
<b>Industry</b>	• Air Traffic Control
<b>Application</b>	• Air Traffic Management
<b>Benefit</b>	• Improved Flight Handling Capacity

These volumes are predicted to increase significantly in the future, and AENA needs to ensure that it can support more flights with the same high safety and quality standards it imposes at present. The organisation asked INECO, one of the world's leading transport consulting and engineering companies, to partner it on an airspace structure analyser known as Mentor.

INECO is a Spanish company with over 30 years' experience managing transport related projects, and its Aeronautical Systems division has worked with AENA on many occasions. The two organisations have previously used simulation packages to help plan air traffic control operations and decided that WITNESS from Lanner offered the best solution for their needs.

"With WITNESS simulation, it is easy to produce models that can be used by experienced and inexperienced users alike," says José Manuel Rísquez of INECO, "this can save valuable time in the presentation and understanding of the results."

**Strict Rules for Air Traffic Control**

Air traffic control is a complex operation that is designed to guarantee safety and provide aircraft with the best possible route between airports. At any given time there will be many aircraft in the sky, and it is impossible for one controller to manage them all. Airspace is therefore split into smaller zones or sectors that can be managed by a single person. Controllers must not be busy for more than 60/70 per cent of the time, so they have time to deal with unexpected events. If too many planes are present in a sector, the controller will be busier than the safety margins permit.

There are strict rules about how many aircraft can occupy a sector, when they can enter or leave and where they can fly. Aircraft must be separated by ten nautical miles longitudinally and laterally, and 1000ft vertically when flying below 30,000ft. The speed of aircraft means that these seemingly large distances, may equate to just a few seconds flying time.

One of the principal activities of air traffic control management, is to ensure that aircraft can proceed on their journey without flying through overloaded sectors. If an overload should occur, a controller's only options are to hold a flight in progress in its current position, or pass it to a less congested sector until it is safe to proceed. Flights entering Spanish airspace must also be accommodated within the air traffic control system.

Airborne aircraft must be given priority over those on the ground, but this often leads to delays as flights sit on the runway waiting for the congestion to clear. More than three quarters of all flight delays are caused this way. Even seemingly simple delays can have a knock-on effect to later schedules. Any delays are unacceptable to operators and passengers. The situation is likely to worsen in the future, unless AENA can identify new ways of increasing capacity in the system.

**WITNESS the Mentor**

Mentor was devised by AENA and INECO, to identify sectors with insufficient capacity in the current structure, and to investigate ways of revising air traffic control operations. In simulation terms, the air traffic control management rules and the parameters that define sectors, can be combined to produce a useful, but complex, interactive model where each sector can be treated as a collection of discrete boxes containing any aircraft. This was created using information from a number of real-life sources including sector layout and capacity, scheduled and forecasted flights.

Mentor was created with WITNESS at the core of the application. INECO developed a special user interface to make the system easier for inexperienced staff and to allow user-defined parameters and inputs from external data sources. This makes it easy for experienced and inexperienced AENA staff to test a number of scenarios. The resulting models are designed to be dynamic, so that parameters can be changed during the simulation to provide an immediate response. The system includes outputs to spreadsheet and graphical applications, supporting a number of interpretive options.



"WITNESS is ideal for these sort of macroscopic applications, as it is easy to build and implement a model with minimal knowledge of programming," says José Manuel Risque. "With Visual Basic we can create a powerful user interface that can easily be used by inexperienced users to drive the simulation, define airspace configurations and select outputs."

#### **Safe Way To See What If**

Mentor effectively flies aircraft between the sectors and destinations inside its virtual representation of Spanish airspace. This means that AENA can test a wide range of "what if" scenarios in a completely safe environment, without involving any real aircraft or passengers. For any scenario, Mentor reveals how demand will vary for each sector over time, highlighting any potential bottlenecks that might occur. It also indicates which sectors will overload, how this will create delays and which flights and airports will be most affected. AENA can use this information to test new configurations, trying out different operating parameters to increase individual sector and overall capacity, to help reduce the frequency and length of flight delays.

One aspect of air traffic control management that Mentor revealed, was a network effect that had been masking other problems in real-life situations. This occurs when an increase in capacity is applied to a specific sector, and the problem appears to be resolved. However, because of the strict rules and parameters that apply, this theoretical improvement can have a knock-on effect that creates a ripple of over capacity, causing flight delays elsewhere in the system.

"The insight that WITNESS has given us has been invaluable," says Francisco Montoto. "It has shown numerous ways of safely improving our flight handling capacity."

All trademarks and copyrights are recognised and acknowledged.

©Copyright 2002 Lanner Group Limited.

[www.lanner.com](http://www.lanner.com)



Lanner helps organisations achieve rapid and effective business change. Based in the UK with subsidiaries and partners in Europe, the Americas and the Far East, Lanner works with more than 3000 top multi-national companies.