itransporte

Transport engineering & consultancy magazine

ENGLISH EDITION

ineco

www.ineco.com

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FEB | MAY 2014

INTERVIEW

José Manuel Tejera, Managing Director of Infrastructures and Transport (Ineco)

"We need to better understand our clients"

NATIONAL AIR TRANSPORT PLAN OF NEPAL

A plan to reach for the sky

COMMUTER RAIL SYSTEM FOR SAN JOSÉ (COSTA RICA)

Tram-train: the best of both worlds

TRANSEUROPEAN CORRIDORS (TEN-T) IN CROATIA

Welcome, EU member state number 28

2013 BENTLEY SYSTEMS AWARDS

HS2: a brilliant inspiration

BRAND SPAIN | Gastronomy: a taste of Spain

Editorial

neco brings together experts in the fields of civil engineering, systems engineering, consultancy and the environment. More than 2,000 experts in transport systems comprise a highly skilled and committed pool of well-trained human capital. These experts are coordinated with the rest of the company through a matrix organisation. Our goal is for each project to satisfy the technical and financial expectations of the client.

It is my pleasure to write this editorial for the 50th issue of our magazine. This issue's cover highlights the long and ambitious ongoing project to modernise Nepalese civil aviation. The input of our airport and air navigation specialists will undoubtedly contribute to improving air traffic flow and, as a result, the socio-economic prospects of a country with great development potential. We are also focusing attention on the Western Hemisphere, where our consultants have been commissioned to prepare studies on improving urban transport in Costa Rica or developing the commercial strategy for an airport in El Salvador. Also in Middle East reported on the recent contract for planning urban transport in the capital of Oman

The high speed rail sector –one of Ineco's main areas of expertise– is the focal point of other reports, such as the article on the project to modernise an international railway line in Croatia or the environmental work in southern Spain.

Last, but certainly not least, I could not fail to mention the interview with José Manuel Tejera, who has recently joined Ineco as managing director of Infrastructures and Transport and whose professional standing and track record will greatly enrich the organisation.

We intend to continue sharing Ineco's knowledge and experience with all of our readers for many issues to come.

Ana Rojo

General Manager of Engineering and Services

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Welcome, EU member state number 28
An international consortium composed of the Spanish companies Ineco and Typsa, along with French firm Egis Rail and Croatian firm IPZ, was awarded the contract for modernising and renovating 80.5 kilometres of railway.

COVER IMAGE: MAHESWOR BHAKTA SHRESTHA

Published by INECO
Paseo de La Habana, 138 -28036 Madrid
Tel. (+34) 91 452 12 56
www.revistaitransporte.com
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Design:ESPACIO28004 / Mariano Serrano, Juanjo Jiménez
Printed by: GRÁFICAS 82
Legal Deposit: M-26791-2007

News

Ecuador

The team from Ineco and collaborating companies, appearing with the Spanish minister, the deputy minister of Transport Management of Ecuador, Fabián Albán de Sá, members of the office of the Minister of Public Works, the minister-counsellor from the Embassy of Spain and the president of Ineco.

The transport agreement between Spain and Ecuador is the driving force behind at least nine projects

Ineco has already launched several projects in Ecuador following the agreement signed on 1st November 2013 in Quito, by María de los Ángeles Duarte, minister of Transport and Public Works of Ecuador, and Ana Pastor, minister of Public Works of Spain, in the presence of Pablo Vázquez, president of Ineco.

The agreement aspires to promote cooperation between the two ministries in the management of transport systems and the development of infrastructure. Ineco will be collaborating in the improvement and development of Ecuadorian infrastructure. The company is participating in technical studies and assessment, among other tasks, for the high capacity road tenders between Santo Domingo, Quevedo, Babahoyo and Jujan, including the Jujan bypass and the Santo Domingo ring road. More than 40 people from Ineco are carrying out important projects, such as the Strategic Plan for Mobility in Ecuador 2013-2037.

Europe

LIFE+MINOx-STREET

This European project led by Ineco has now officially commenced. MINOx-STREET is being funded by the European Commission under the LIFE+2012 programme (AIR section), part of the European Union fund for the environment. This shows the high quality of the company's work and its recognition within the environmental sector. The project's goal is to evaluate and optimise the efficiency of existing photocatalytic technologies to reduce levels of nitrogen oxides (NOx), including NO_2, present in city air. The project will involve compiling all the findings into a guide for local authorities and a set of protocols for the use of photocatalytic materials. **The MINOx-STREET team** consists of several organisations, including the different stakeholders in a project of this nature: Alcobendas City Council, CIEMAT and CEDEX, with Ineco at the helm.«

Spain

STRATEGIC PARTNERSHIP

Alliance with Metro de Madrid on international projects

The ceremony at which the agreement was signed took place at Metro de Madrid's "Nave de Motores de Pacífico" building.

Pablo Vázquez, president of Ineco, and Ignacio González, CEO of Metro de Madrid, recently signed an agreement in the presence of the minister of Public Works of Spain and the president of the Community of Madrid. The agreement sealed a strategic alliance for collaboration between the two companies to jointly develop urban land transport business activities on an international scale. The aim is to harness the knowledge and experience of the two organisations and take advantage of their synergies to create a more competitive joint offering for international business.«

Brazil

Above is the cover of the regional airports plan for Brazil. On the right: José Batlles, Brazil country manager; José Ángel Higueras, Aviation Business director; Wellington Moreira, minister of the Civil Aviation Authority; Guilherme Ramalho, executive secretary of the SAC; and Thiago Pedroso, project manager from the SAC.

AIRPORT IMPROVEMENT PROGRAMME

ATP and Ineco to modernise 50 regional airports

The Civil Aviation Authority of Brazil (the Secretaria de Aviação Civil, or SAC) has awarded the consortium of Ineco and ATP the tender for the modernisation, construction, expansion and renovation of 50 regional airports as part of its airport logistics investment programme. In its first phase, this programme includes the modernisation and improvement of the management and facilities at 270 regional airports. The region awarded to Ineco-ATP comprises 50 airports in the Brazilian states of Espírito Santo, Goiás, Minas Gerais and Rio de Janeiro. The contract amounts to more than 8.2 million euros and the term of execution is 24 months. The work will be performed in equal parts by ATP and Ineco. Ineco will be carrying out its share of the work in its offices in Madrid and will, along with ATP, be assisted by an office in Brasilia. The work includes the preliminary and technical feasibility studies, preliminary projects and final projects, geotechnical and pavement analyses and construction projects for the airport facilities.«

INNOVATION

GRAIL 2, PROJECT COMPLETED

Safer high speed trains through satellites

A consortium led by Ineco has completed the GRAIL 2 project, which began in 2010 with the goal of researching and testing potential applications of Europe's EGNOS satellite system for high speed railway lines. Included in the 7th European Framework Programme, it is based on determining the speed of the train via satellite. It offers benefits such as improving positioning and cost efficiency while maintaining the required level of safety. The multinational consortium that carried out the project, which was led by Ineco, included Adif, Ansaldo STS, Thales-Alenia Space, NSL, Alstom, AZQ, Refer, IQS and Aena internacional.

THE PICTURE **shows attendees at the last work meeting held in Madrid.**
For more information: http://grail2.ineco.es

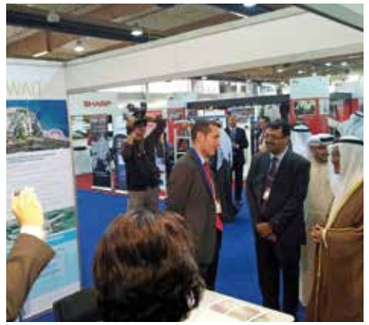
News

Spain

Technical seminars on bridge maintenance

Last November Leendert de Haan, an Ineco senior expert on Structural Evaluation and Pathology, participated in a technical seminar organised by BASF Construction Chemicals with a presentation on concrete infrastructure entitled "Analysis of Repair and Protection Costs" in which he talked about the benefits of preventive over corrective maintenance.

Kuwait



Forum on airport expansion

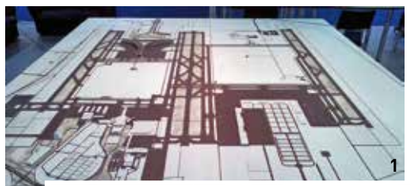
Ineco had a stand at the forum organised in December by the Directorate General of Civil Aviation of Kuwait (DGCA) to publicise the expansion of the Kuwait International Airport (KIA). Carlos Amigo, country manager from Ineco, gave a presentation on the project, for which the company has also recently updated the Master Plan. (see *itransporte 49*).«

Australia | Saudi Arabia

10th WORLD CONGRESS ON RAILWAY RESEARCH (WCRR)
17th WORLD CONGRESS OF THE INTERNATIONAL ROAD FEDERATION

Innovative projects at two world congresses

Australia and Saudi Arabia have, respectively, recently hosted the two most important congresses in the rail and road technology sectors. A variety of experts from Ineco gave presentations at both of them on some of the company's innovative projects. The **10th World Congress on Railway Research (WCRR)** took place in Sydney from 25th to 27th November. There, Virginia Antón gave a presentation on the results of the GRAIL 2 project and Mario Ferreiro gave another on the DETEC system (see *itransporte 47*). This is an in-house innovation project that allows for remote monitoring of tracks via the internet. Also attending the congress was Alberto Fernández, Ineco representative for the Asia-Pacific region. Elsewhere, Riyadh, the Saudi capital, played host to the **17th World Congress of the International Road Federation** from 10th to 14th November. Attending on behalf of Ineco were Jorge Engels, business development manager in Middle East and Africa, and Elena Puente, who presented the findings from Pilot4safety. This project, completed in 2012, focused on designing a common European training system for road safety inspectors and auditors (see *itransporte 46*).«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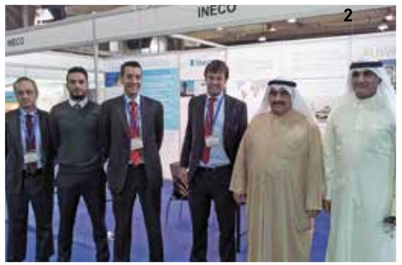

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1_Model of the expansion built under Ineco supervision.
2_From left to right, part of the Ineco team: Antonio Caballero, contracts manager; Yousef Al-Jaouni, expert in airport planning; Carlos Amigo, country manager; and Jorge Engels, business development manager in the Middle East and Africa, with executives from the DGCA.

A plan to reach for the sky

Modernising civil aviation in Nepal

With the collaboration of **Santiago Gómez de Olea**, project manager in Nepal, and **José Luis Pardo de Santayana**, aeronautical engineers
Photos: **Elvira Vila** and the Ineco team

In this Himalayan country, home to the world's largest number of eight-thousand-metre peaks, air transport is vital to commerce and tourism. The Civil Aviation Authority of Nepal (CAAN), aware of the importance of implementing its technological and organisational capacity, has entrusted Ineco with drawing up a strategic modernisation plan.

Among the key aspects of the Nepal National Air Transport Plan being prepared by Ineco are the revision of all aeronautical legislation, to harmonise it with international standards, and the steps towards restructuring the CAAN (Civil Aviation Authority of Nepal) into two separate bodies: the regulating body, which will continue to be called CAAN, and the air navigation and airports operator NAANSA (Nepal Airports and Air Navigation Services Authority). To complete this major reform, Ineco's experts are tasked not only with designing the new organisation but also defining its technological needs and implementing the solutions. They will likewise prepare a training plan for all civil aviation personnel. The Plan defines the future of air transport in Nepal for the next 20 years, including the development of airports and air navigation systems.

Nepal's extensive airport network –48 in total– reflects the overriding need to overcome geographical barriers: in addition to Mount Everest, the highest mountain in the world at 8,848 metres, Nepal has eight of the 14 peaks standing at over eight thousand metres in height that make up the Himalayan mountain range, which is shared with neighbouring Tibet (China), India and Pakistan. The country's interior is also home to a vast region of hills and valleys, with countless rivers flowing towards the southern strip of fertile wetland where most of the 27 million inhabitants live.

Ineco heads the winning consortium, which also includes the Spanish engineering company Prointec and the Nepalese consultancy firm ERMC. The contract, signed in December 2011, amounts to some 3 million euros, all financed by the Asian Development Bank. The work will be executed over the course of three years, during which various studies and projects will be undertaken to outline a 20-year strategic plan.

The progressive liberalisation of world air transport is an opportunity for economic growth in Nepal. To be competitive, however, many reforms will be needed there to strengthen air transport safety and endow

Ineco heads a project that will enable a strategic plan to be outlined for the next 20 years

the country with the infrastructure required to absorb the potential domestic and international traffic. Lowering airfare will stimulate domestic air traffic. It will also be crucial to develop a sales and marketing strategy to increase earnings from non-aeronautical activities, such as managing commercial spaces and duty-free shops, as well as operating restaurants, information offices, car parks, advertising spaces, etc.«

AIRCRAFT TO OVERCOME GEOGRAPHICAL BARRIERS

The hippy movement of the 1960s revealed the extraordinary beauty of Nepal to the world. Attracted by its ancient culture and formidable natural environment, thousands of tourists and mountain lovers began flocking to this remote country. Since then, the aeroplane has become Nepal's mode of transport par excellence, and the only means capable of overcoming the rugged terrain, paucity of infrastructure and a deficient road network. Today, tourism is the main industry and one the country's most important sources of wealth.

PHOTO: ELVIRA VILA

Managing future demand depends on implementing ICAO standards and best practices, passing new legislation on air traffic safety and signing more agreements to foster international trade

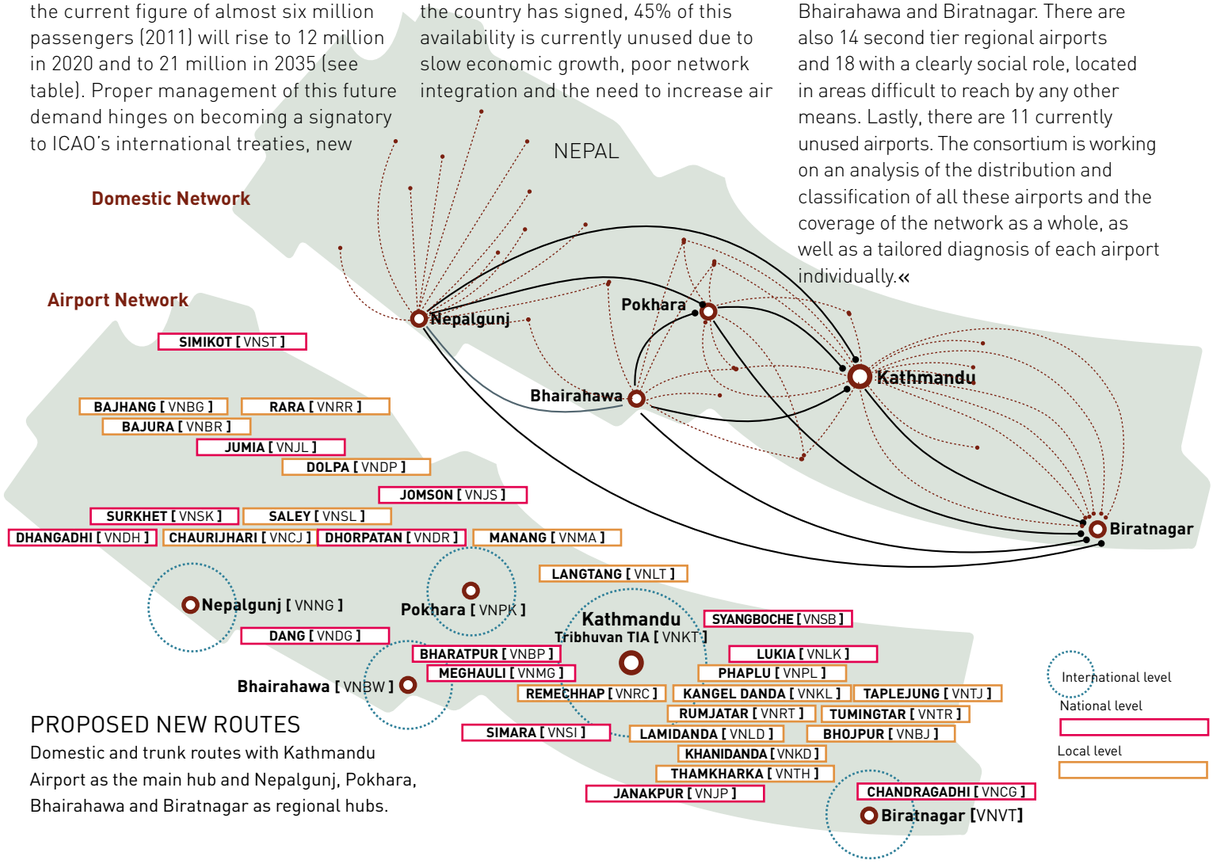
New air routes...

With the goal of achieving a safety framework in line with international standards, Ineco performed a diagnosis of the current situation and made numerous recommendations to handle the expected increase in demand: if domestic and international traffic have respectively doubled and tripled over the last ten years, the forecast is that the current figure of almost six million passengers (2011) will rise to 12 million in 2020 and to 21 million in 2035 (see table). Proper management of this future demand hinges on becoming a signatory to ICAO's international treaties, new legislation to ensure air traffic safety and more bilateral agreements to promote trade with the international community.

Flanked by its giant neighbours India and China, Nepal has a great deal of untapped growth potential. Yet, despite a capacity of 5.25 million seats per year according to the agreements the country has signed, 45% of this availability is currently unused due to slow economic growth, poor network integration and the need to increase air transport safety and adapt the existing infrastructure to meet international civil aviation standards.

The 48 airports

The main airport is Tribhuvan International Airport (TIA) in Kathmandu, after which there are four other airports acting as regional hubs: Nepalgunj, Pokhara, Bhairahawa and Biratnagar. There are also 14 second tier regional airports and 18 with a clearly social role, located in areas difficult to reach by any other means. Lastly, there are 11 currently unused airports. The consortium is working on an analysis of the distribution and classification of all these airports and the coverage of the network as a whole, as well as a tailored diagnosis of each airport individually.«



PROPOSED NEW ROUTES

Domestic and trunk routes with Kathmandu Airport as the main hub and Nepalgunj, Pokhara, Bhairahawa and Biratnagar as regional hubs.

Helicopter operating in the Himalayas

Buddha Air facilities at TIA.

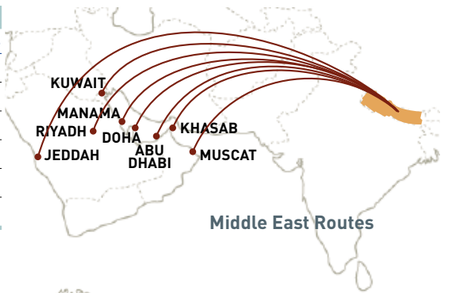
From left to right, Ineco engineers Julio Resino and Santiago Gómez de Olea, with Bijaya Sthapit, project coordinator.

New aircraft...

- **The anticipated demand will entail rethinking the current fleet of the national airline, Nepal Airlines, and outfitting the infrastructure of the airports in which airlines must operate. With a network of 48 airports, there is strong potential for the growth of private companies, although it is also true that many domestic airports have unpaved landing strips with limited runway length. Ineco has submitted recommendations with various investment and financing scenarios, specifying the type and model of aircraft best adapted to the airports and routes involved.**
- **The use of light aircraft and helicopters is typical of this region given the difficulty in reaching remote settlements in the Himalayan mountain ranges and the constant demand for religious, photographic and sports tourism.**

Anticipated increase in air traffic (in millions of passengers)

YEAR	TOTAL	TIA	BIRATNAGAR	GAUTAM BUDDHA	NEPALGUNJ	POKHARA	OTHERS
2011	5.94	4.35	0.37	0.12	0.14	0.37	0.58
2015	8.59	6.46	0.54	0.18	0.27	0.59	0.55
2020	11.73	8.83	0.73	0.25	0.37	0.81	0.75
2025	14.88	11.19	0.93	0.31	0.46	1.03	0.96
2030	18.03	13.56	1.13	0.38	0.56	1.24	1.16
2035	21.18	15.93	1.32	0.45	0.66	1.46	1.36



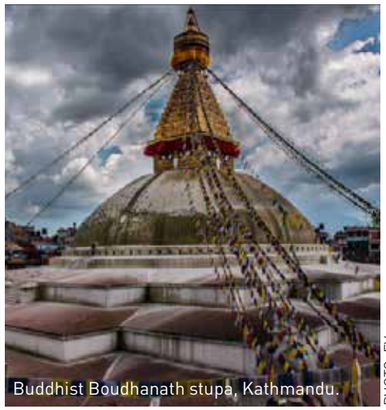
Middle East Routes

Routes to South-east Asia

Routes to Europe

PHOTO: COURTESY OF MAHESWOR BHAKTA SHRESTHA

Control Tower of Tribhuvan International Airport (TIA).



Buddhist Boudhanath stupa, Kathmandu.

PHOTO: EV

THE TEN KEY POINTS OF THE PLAN

Internationalisation and safety, the project's backbone

- Adapt local legislation to international standards.
- Promote a foreign policy involving more bilateral agreements.
- Separate the regulatory body (CAAN) from the airports and air navigation authority (NAANSA).
- Define fleet inspection programmes and personnel training.
- Outline a plan to enhance the safety, protection, sustainability and efficiency of the air transport system and the new CAAN and NAANSA organisations.
- Implement modern human resources management and training in the two new bodies.
- Provide the means to make the airports safer.
- Manage aeronautical fees and raise commercial income with an airport commerce plan.
- Prepare a specific strategy for MPS (Mandatory Public Service) routes.
- Foster domestic traffic, essential for the development of the air transport system.

The Asian Development Bank awarded the project managers a diploma for good management.

The Ineco team at Nepalgunj Airport.

Biratnagar Airport control room.

THE HIMALAYAN MOUNTAIN RANGE

Aerial view near the foothills of Mount Everest.

FOTO: EV

Hanuman Dhoka Durbar Square.

PHOTO: EV

INTERVIEW | **RATISH CHANDRA LAL SUMAN**

General Manager of the CAAN (Civil Aviation Authority of Nepal)

"We are working hard to increase the safety in the Nepalese air transport system"

By **Santiago Gómez de Olea**, project manager in Nepal

Aeronautical engineer by profession, 54, he has been working for the last 23 in CAAN, where he also held the positions of Deputy Director General and General Manager of Tribhuvan International Airport.

Air Transport Plan of Nepal formulated by Ineco and its partners foresee great prospects for growth in air traffic in the coming years. How do you foresee the need for investment in infrastructure to meet this demand?

We agree with the air traffic forecast developed by Ineco and its partners. We are working hard to increase also the safety in the Nepalese air transport system.

Presently, we are investing more than 90 million USD in the first phase development of Tribhuvan International Airport (TIA) at Kathmandu. We are also calling bids to develop the current Bhairahawa Airport into Gautam Buddha International Airport as another international airport in the country.

We are investing also in the domestic airports. There are many isolated areas in which air transportation is the only solution for tourism development and social connectivity for the population living in those areas. The Plan has also included the development of the Air Navigation System.

What kind of joint actions you foresee the government of Nepal is taking for an integrated development of Tourism Board, Aviation Authority and Nepal Airlines?

The Ministry of Culture, Tourism and Civil Aviation is in charge of both, tourism and air transport sector development in Nepal. All planned actions for the future development of the air transportation, including

"All planned actions for air transportation take in consideration the tourism development plans"

the Airport Plan and Air Transport Plan developed by Ineco take in consideration the tourism future plans. As an example of integrated development of both sectors by the government, we have the purchase of some new aircraft to strengthen Nepal Airlines in order to bring more tourists to Nepal and facilitate the connectivity with some tourist destinations inside Nepal.

The Ineco reports analyse the pros and cons of dividing TIA. How long will TIA continue to be the only international airport and when it will share traffic with other international airports?

Nowadays, TIA is the only international airport in Nepal, but with the upgradation of Bhairahawa Airport into Gautam Buddha International Airport, that is expected to be completed by 2017, we will have two international airports to manage the forecasted international traffic and it won't be necessary for the airlines to go to other countries if there is any issue at TIA. We have also a plan to develop another big international airport 70 kilometres south of Kathmandu, in case of TIA will not cope with the expected traffic, domestic and international.

One of the conclusions of the Air Transport Plan is the need to separate domestic traffic at TIA. Will that be one of your priorities? How do you plan to revive it?

Presently, the domestic traffic is congesting TIA during peak winter periods and this is something we have to solve. We are suggested to send STOL flights (Short Takeoff and Landing) departing from TIA to another new STOL airport. We are trying to look for a new location close to Kathmandu. If it is not possible to find a new location, we will try to divert some of the STOL flights to another domestic airport in Nepal.

How do you envision Nepalese aviation in 2020?

In 2020, Nepal will have a modern and safe Air Transport System. We will have, at least two international airports in full operation and another three regional ones, with the potential to accommodate some international regional flight. By then, we will have a regulator (CAAN) to ensure high level of safety and an operator (NAANSA) that will operate and maintain our airports and air navigation infrastructures. In this endeavour, some private sector investment may also be attracted to manage the airport system.«

INTERVIEW | **PUNYA RAJ SHAKYA**

Project Director, Civil Aviation Authority of Nepal (CAAN)

"Once we improve air safety, many airlines will be interested in coming to Nepal"

By **Santiago Gómez de Olea**, project manager in Nepal

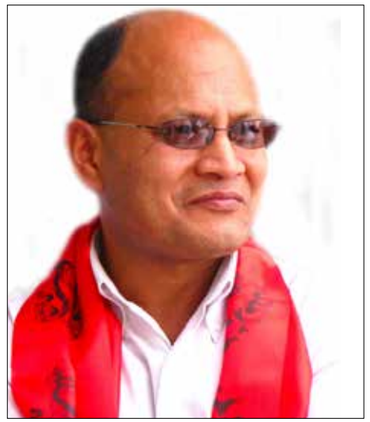
This 52 year old aeronautical engineer is responsible for the Manage Air Transport Capacity Enhancement Project, with funding from the Asian Development Bank (ADB). He also directs the Tribhuvan International Airport Improvement Project. Previously, he was director of Department of Aerodrome Safety and Standards.

What benefits will the separation between the regulator and airport operator bring to air traffic growth and flight safety in Nepal?

The separation of CAAN in two new organisations, CAAN as a regulator and NAANSA as an airport operator and Air Navigation System Service Provider will help to improve not only in the flight safety, but also in the airport and air navigation systems' safety. The new operator, NAANSA, will focus only in operating and maintaining airports and air navigation system according to the international and national safety standards; while the new regulator, CAAN, will focus on preparing the regulations, standards, guidance materials and carry out safety oversight of service providers.

Nowadays CAAN is working hard to improve safety in the air transport system. The distinct separation of these two organisations will eliminate conflicts of interest between operators and regulator that exist in present structure of CAAN. NAANSA will implement safety standards and the CAAN as the regulator will ensure that NANSA will comply with national and international safety standards thus ensuring safety of air transport system.

Once safety of Nepalese air transport system improve, more international airlines will be interested in coming to Nepal because of the high potential of the tourism, due to natural heritage such as high mountains, lakes, wildlife and cultural diversities and religions in the country. As there is a potential for continuous growth of air traffic in Nepal, the aviation industries will need new infrastructures, equipment and human resources to accommodate the increased air traffic demand. CAAN has already developed National Airport Plan and Air Navigation Plan as well as National Air Transport Plan, which will guide NAANSA to implement those plans in order to accommodate the expected growth of air traffic till the year 2035.



"The separation of CAAN in two new organisations will eliminate conflicts between operators and regulator (...) but it will not be an easy task"

Ineco experts working in the Capacity Development Project of CAAN have already formed a part of your organisation for over a year now. How would you rate their work?

Ineco experts have been working hard in all different areas of the project, and are defining the future of the air transportation in Nepal. They have been involved in all the areas of the project with expertise and dedication. Now, we are involved in the final definition of the new organisations, regulations and automation of the information. We need full support of Ineco, Prointec and Ermc experts to establish new organisations, with new technologies and implement new Human Resource plan.

During this period, the training of the CAAN and NAANSA future staff will be critical for the success of both the new organisations. Now we are confident about the expertise of Ineco and we think that they will be able to conduct the study, provide all deliverables as per the scope of the project within the contract period.

New organisations, training, computerisation, infrastructure development, safety ... those are a lot of open fronts. Which would you say are the most pressing of today's challenges?

The most challenging part of the project will be the implementation of the separation of the CAAN into two new organisations, including information technologies and training. Ineco has involved most of the CAAN officials at different stages of the project through workshops and meetings, including the trade union officials, so everybody knows what is coming up and it will be easier to transform, but nobody says that this task will be easy. We think the most of the staff will be happy with their new positions and some staff may not be so happy, but we will work together to get this transformation happen.«

Tram-train: the best of both worlds

Analysis of a commuter rail system for the San José metropolitan area

By ***itransporte***, with the collaboration of **Ignacio Monfort**, **Alberto Váscones**, **Francisco Ortiz** and **David Maté**, civil engineers

Central Costa Rica may soon be served by new tram-train rail system, which combines the advantages of modern trams with the power and speed of commuter trains. The feasibility study conducted by Ineco is part of a collaboration agreement with Spain.

Every day a million people use a dense network of 431 bus lines to move around what is known as the 'Greater Metropolitan Area' (GAM, per its Spanish initials), which spans four provinces in the geographical centre of Costa Rica: San José, home to the capital of the same name, Alajuela, Cartago and Heredia. Together, the large urban hubs and the suburban municipalities contain 2.6 million inhabitants, 60% of the country's total population, in an area of just over 2,000 square kilometres. Ineco has studied the technical and financial feasibility of a tram-train commuter system to provide service to the whole area. The tram-train is a low-floor light rail system with the characteristics of a tram in urban areas and of a train in suburban areas. To implement it, the existing infrastructure would need to be fully renewed.

Congestion is a common feature of travel in the GAM. A study by the National University of Costa Rica in 2009 estimated that 72% of the average daily traffic experienced congestion, and that each vehicle spent an average of 10 kilometres in traffic jams every day. This study and others highlight the same causes: heavy and unplanned urban growth, much of which is concentrated around a relatively small area of infrastructure, including schools, health clinics and workplaces (85% of the country's industries are located in the GAM). This is a problem which remains unresolved despite the restrictions on the use of private vehicles, which were introduced for environmental reasons in Costa Rica from 2005 on.

Bringing back the train

In light of this situation, in 2004 the Costa Rican government began to restore the old passenger transport alignment in the GAM, which had been in disuse. Currently, 218 kilometres of the national network are in service. On 185 kilometres (Caribbean Sector) there are two goods lines in operation for the carriage of steel and bananas to the ports along with two tourist trains. On 33 kilometres, in the GAM, there are two railway lines from San José Pacífico to Pavas and Belén, and another two from San José Atlántico to Heredia and Cartago, the latter having been opened recently, in May 2013.

Ineco has studied the technical and financial feasibility of a tram-train commuter system to serve the whole San José metropolitan area

At the same time, there have been studies for a number of years now on how to develop and finance a modern commuter rail system with sufficient capacity to improve the flow of transport in the metropolitan area. With this objective in mind, in recent years Costa Rica has signed several cooperation agreements with Spain. The last of these was signed in November 2012, covering a period of three years and involving the participation of Spanish companies in the future development of the country's railways, including the construction of infrastructure and the possible management or co-management of future rail services. It also establishes new contracts to supply trains, which will join the 13 trains from the company formerly known as FEVE, which were acquired by Incofer starting in 2008. The Ineco study is also part of this agreement.«

The numbers

- **The study includes an operation plan and an economic and financial assessment for the commissioning of the suburban train. It considers different demand scenarios based on actions relating to collective public transport. Accordingly, an estimate has been made of the total required investment in infrastructure and rolling stock as well as operating costs.**

- **A Cost-Benefit Analysis for the project has also been prepared. The analysis evaluates time savings and other external effects, such as safety and accidents, reduced CO_2 emissions and other savings affecting agents not directly involved in transport operation.**

Project highlights:

- **76 km of double-track with a 1,067 mm gauge.**
- **Stops with 80 m platforms for low-floor vehicles.**
- **6 km of slab track and 70 km of ballasted track.**
- **Track electrified at 1,500 V.**
- **50 km/h in the city and 100 km/h on suburban sections.**
- **Remote controlled safety and communications.**
- **Duplication and restoration of more than 30 bridges.**
- **40 bridges restored.**
- **A Central Operation Station (COS).**
- **Renewed workshops and sheds.**

Traffic jams in the GAM.

Locomotive entering Cartago station.

The study includes an analysis of demand, the infrastructure design, the proposed choice of rolling stock, an operation plan for the new lines, an estimate of the investment required and an economic and financial assessment

PROPOSAL

A lightweight, fast and versatile train

Ineco's work has included an analysis of demand, infrastructure design, the proposed choice of rolling stock, an operation plan for the new lines, an estimate of the investment required and an economic and financial assessment.

The feasibility study proposes opting for a mixed railway system (tram-train type), which would link the provinces of San José, Cartago, Heredia and Alajuela. The proposal is to develop the system in two phases, in 2015 and 2017, at the end of which there would be a fare integration scheme between the bus and train services.

Diagnosis for the infrastructure. To determine which technical solution would be the most appropriate, a diagnosis was of the current state of the rail infrastructure was made. The alignment currently in service consists mostly of Cape gauge (1,067 mm) single-track without signalling or electrification, and is traversed by numerous level crossings for both pedestrians and vehicles. It has 20 stations which, with some exceptions (San José Atlántico, La Salle, Santa Rosa, Universidad Latina and Tres Ríos), lack platforms. All of this limits both the frequency and the capacity of the trains.

Poor conditions were observed in general in the unrenewed sections, as well as on the terrain (which has a low bearing capacity), the platform and the tracks, which are virtually devoid of ballast and feature damaged sleepers, rails and sets of points. In urban areas, the slab track was also found to be in poor condition.

DESIGN OF STOPS
The proposed new stops have a simple design that elegantly incorporates them into the surrounding environment, with platforms 80 metres long and between 2 and 2.5 metres wide.

Train bound for San José.

Stretch of track.

Restoration and renewal. Ineco's proposal involves a complete renewal of the infrastructure, installing a double-track, electrified at 1,500 V, and no change to the current track gauge. The track would be mounted on slabs in urban areas (six kilometres in total) and over ballast for the remaining 70 kilometres. It would be necessary to restore a total of 40 bridges and build nine more. The study estimates that, once renewed, the line could reach a top speed of 50 km/h in the city and twice that on the suburban sections. For this purpose, it will feature modern railway safety installations, including remote controlled electronic signal boxes and a Central Operation Station (COS), with centralised traffic control (CTC), both of which would be located at Pacífico station, where there are existing workshops that would be adapted for the new trains. The shed area would be adjacent to the workshops.

The proposed new stops have a simple design that elegantly incorporates them into the surrounding environment, with platforms 80 metres long and between 2 and 2.5 metres wide, suitable for double compositions (which would increase the line capacity) and adapted for low-floor vehicles.

Rolling stock. An analysis was done to determine which of the available technologies best suits the project: commuter train (conventional rail), tram or a mixed system combining features from both. The commuter train is more suitable for large densely populated urban areas, and is the system with the greatest capacity and highest speed, although it involves a bigger investment. Modern trams and mixed systems involve lower costs and are designed to be integrated into the urban fabric. Furthermore, since they have a low floor they are accessible to users with disabilities. ALAF, the Latin American Railway Association, defines a tram-train as a "light articulated vehicle that functions as a commuter train in the greater metropolitan area and as a tram in the urban area", that is two-way and that uses electric traction. Its main advantage is its ability to move passengers "from the outskirts to the city centre without transfers", which "allows it to achieve very competitive travel times compared to other means of transport".«

Submission of the project to the president of Costa Rica

In the picture, from left to right, Edgar Ayales, Finance minister; Miguel Carabaguiaz, president of Incofer; Elena Madrazo, Spanish ambassador to Costa Rica; Luis Liberman, vice president of Costa Rica; Apolinar Rodríguez, international director for Renfe; Laura Chinchilla, president of Costa Rica; José Ángel Higueras, Business director for Ineco; Pedro Castro, minister of Public Works and Transport; Alberto Váscones, director of Railway Projects for Ineco; and Bernardo Hernández, economic counsellor for the Embassy of Spain.

Holding the line

The AV-RAMS project optimises maintenance by analysing real data

By **Arsenio Andrés**, civil engineer

Rail junction maintenance under extreme conditions.

AV-RAMS is a calculation method developed by Ineco for the maintenance of high speed lines using, for the first time, real data from infrastructure and superstructure faults on lines in operation, such as those linking Madrid with Barcelona, Valencia and Valladolid.

The aim of the AV-RAMS project is to detect the most frequent causes of track infrastructure and superstructure faults (not to be confused with breakdowns) on high speed lines and to define the best solution to the most common incidents. This pioneering project is the first to eschew a purely theoretical basis in favour of a trove of empirical data taken from lines in active service. The project aims to optimise the design of maintenance plans to save time and resources, which is why this kind of study is increasingly demanded internationally.

A RAMS *(Reliability, Availability, Maintainability and Safety)* plan includes all the factors that need to be taken into account in a railway project throughout all the phases of its life cycle. RAMS parameters can be described as qualitative and quantitative indicators of the degree to which the system can be relied upon to work as specified while, at the same time, remaining available and safe.

Ineco has developed this innovative initiative by applying its extensive experience with the Spanish high speed rail network (see *itransporte 39*) to enhance both preventive and corrective maintenance.

Based on real incidents

Superstructure and platform or infrastructure systems and the relationship between them were studied in this project, producing studies that may subsequently be applied to other railway systems. A complete RAMS study analyses the entire life cycle of a system. The AV-RAMS project focuses solely on the operation and maintenance phase, and only for lines designed for speeds above 300 kph. To carry it out, a detailed statistical analysis of thousands of actual incidents was performed, differentiated by line, subsystem or component involved, maintenance bases, geographic area, etc.

AV-RAMS is a pioneering project by Ineco based on thousands of real data inputs from operational lines

It is important to note that this study is based on real historical data: more than 150,000 inputs from more than 100 databases and over 7,000 incidents of all kinds from three high speed rail lines have been processed: Madrid-Barcelona, Madrid-Valladolid and Madrid-Levante, totalling more than 1,200 kilometres. The vast majority of RAMS studies are theoretical and are done a priori, before commissioning. This project, however, has collected real empirical data obtained during the operational phase, analysing a posteriori whether the results corroborate the prior theoretical study.«

From AV-RAMS to OPTEMAN

Various subsystems are studied in the project, related both to infrastructure (fencing, drainage, embankments, cuttings, tunnels, viaducts and other such structures, access ways and platform) and to superstructure (ballast, rail, fastenings, sleepers, rail junctions, alignment and levelling faults via dynamic inspection).
The data from each of these elements have been gathered over time from the maintenance depots located at various points throughout the network.

Faults in the infrastructure, however, are generally less explicit and more difficult to categorise. The easiest way to study the incidents is to relate them to the maintenance costs of each subsystem (i.e. embankments, cuttings, viaducts, drainages, etc.) over many years. This enables to generate an approximation of the subsystems most liable to fail –whether because they were poorly built or due to recurring faults– and for which maintenance costs have been highest.

AV-RAMS is followed by OPTEMAN, an innovative new Ineco project that completes the methodology pioneered by AV-RAMS with a study based on real data from the signalling, communications and rolling stock systems, while also analysing maintenance costs and life cycles.«

Night-time track renewal work.

Track buckling devices on viaducts.

Contreras viaduct.

Machinery pit located at the Villarrubia de Santiago (Toledo) maintenance base on the Madrid-Valencia high speed rail line.

Track stabiliser performing maintenance work.

Biomimicry or the art of imitating life

Environmental recovery in arid zones following high speed rail works

By **Antonio Ferrer**, **Alejandro Martínez** and **Diego Martínez**, civil engineers

The restoration of plant biodiversity in desert land after the construction of communication and transport infrastructure, or encouraging plant growth to create green defence shields against harsh weather conditions, is now an economic reality and ecologically both needed and feasible.

The construction of the Murcia-Almería high speed rail line has become a shining example of the environmental integration of large infrastructural works into fragile, arid lands. To this end, Ineco, which led the works for Adif on the four sections that have already been completed, applied simple bioengineering techniques based on the use of local flora. With consultation and scientific support from the Conservation Biology research group at the University of Almería, a number of spectacular restoration processes have been achieved on the slopes, borrow pits and landfills left by the works

This success arises from the implementation of innovative action programmes based on biomimicry techniques –that is, duplicating natural habitats as faithfully as possible– with a survival rate of more than 92% for artificially planted native vegetation and an economic performance that exceeded expectations.

In all the actions undertaken –including planting, seeding and hydroseeding– native plant species from the Almería subdeserts were used. Throughout their evolutionary history, these species have developed a great number of special adaptations that allow them, for example, to minimise water loss, promote the vertical hydraulic redistribution of the water accumulated in the soil during the diurnal cycle, take advantage of the wind's carrying force to generate islands of fertility and withstand both the wild and domestic fauna native to the territory.

The arid lands in Almería and, more broadly speaking, those of the south-east of the Iberian Peninsula, have historically posed a massive challenge to environmental restoration work. The absence of specific protocols has been a major determining factor in the repeated failures that have occurred, in many cases even leading to the introduction of alien and/or invasive species. The climate and soil have likewise always served to limit the introduction of plants using conventional treatment options. This is why the Murcia-

Ineco, which led the works for Adif on the four sections that have already been completed on the Murcia-Almería line, applied simple bio engineering techniques based on the use of local flora

Almería AVE works, which began in 2009 and were co-financed by the European Regional Development Fund, posed such a huge challenge. They required innovative scientific proposals for restoring the affected ecosystems. In the province of Almería four sections of the line have already been built so far between the municipality of Vera and the town of Los Arejos. »

The environmental integration of the landfills (in the background) has been quite successful.

The degree to which the planted vegetation has taken root is very high, despite the harsh edaphoclimatic conditions of the land.

The slopes have been stabilised as a result of the plant growth.

The acclimatisation and rooting quality of nursery seedlings has been crucial to the success of the project.

Just two years after the project, plant development has been surprising.

Sorbas tunnel.

SUCCESSFUL RESTORATION

A total of some 200 hectares have been affected by the works, where 645 indigenous plant species were found, 150 of which have been used. 92% of the planted specimens have survived.

The work done here goes far beyond the scope of a mere scientific and technical trial. There is no question as to its large-scale applicability and the possibility of exporting the technique to other international arenas

They cover a total of 27.8 kilometres, 7.5 of which run through the Sorbas tunnel (see *itransporte 47*), which was built to minimise the impact on the protected area, the Site of Community Interest (SCI) at Sierra de Cabrera-Bédar. Overall, the area affected by the works spans some 200 hectares.

Native plant species

150 different native plant species have been used for the four eco-restoration projects, the seeds of which were gathered locally, thus ensuring their adaptation. After the seed collection, over a hundred plants were produced in a nursery, with the additional challenge that the reproduction protocols were unknown for 70% of them, while for another 20% the manner in which they would respond to large-scale cultivation in terms of their need for irrigation or pest control was also unknown. Some innovative techniques were also tested for deployment in extreme conditions: practically vertical slopes, gypsum substrates, etc.). In all, over 3,000 kilograms of seed by dry weight were used to develop hydroseeding and direct seeding designed specifically for the work sites and more than 800,000 seedlings produced in the nursery have been planted.

Progress of a *Sedum sediforme* seedling planted on a vertical rocky slope in gypsum.

The exceptional capabilities of the native flora used and the quality control measures practised before and during planting have facilitated the colonisation of a wide range of geological substrates –such as marl, schist, phyllite or gypsum– that cannot be considered soil or topsoil, due both to their depth and their physicochemical characteristics. A key aspect is that all of this has been achieved at no additional cost, such as would involve the use of fertilisers, for example, to ensure the viability of the plantations.

Because of their size, the work done here goes far beyond the scope of a mere scientific and technical trial. There is no question as to the applicability of the results obtained on a large scale and the possibility of exporting them to other international arenas.

The arid lands in Almería and, more broadly speaking, those of the south-east of the Iberian Peninsula, have historically posed a massive challenge to environmental restoration work

This means many of the Almerian species used are also being distributed in arid regions of North Africa, Turkey and the Arabian Peninsula. They can thus be used to create shields, rings and "green belts", which allow the biological fixation of moving substrates, such as sand, or the control and cohesion of particles carried by dust storms to create islands of fertility along railway infrastructure, roads or large pipelines and water diversions.

They can also be useful when xeriscaping for low water consumption to help tackle climate change, to create "green roofs" for large commercial and industrial buildings, or for urban soils in arid and semi-arid regions.«

Main benefits achieved

- **Slope stabilisation and reduction of the intense erosion typical of the region.**
- **Minimisation of dead plants, maximum degree of rooting and exceptional vigour in plant development as a result of the use of local species with specific adaptations for drought, wind and water erosion, the permeability of the substrates, etc. This provides direct and long-term benefits for the sustainability of the built infrastructure since it not only decreases the cost of implementation, but also the cost of maintenance and management of the regenerated vegetation cover.**
- **Environmental defragmentation of the territories through which the railway line runs, as a significant amount of plant diversity has been recovered in a very short timeframe.**

Interview | JOSÉ MANUEL TEJERA

Managing Director of Infrastructures and Transport (Ineco)

"We need to better understand our clients and harness the potential of our experience and wonderful team"

At Ineco headquarters, we interviewed José Manuel Tejera, who was appointed managing director of Infrastructures and Transport in late 2013. His career has been forged at multinationals like Alstom, where he worked as head of AVE Maintenance Engineering for Spain, COO of the Bombardier-Alstom joint venture for the maintenance of the Washington-Boston (USA) high speed rail line and project manager for Portugal. He has also worked for Nertus, where he was the general manager and CEO, and for Siemens, where, among other positions he held, he served as general manager of Railway Systems for Southern Europe and general manager of Mobility for Spain. Now, at the age of 45, he will assume one of the three general management positions at Ineco with the primary task of attending to the company's clients.

Your career is very closely aligned with Ineco's scope, particularly with the railway sector. Do you see your position at Ineco as a continuation or a challenge?

Any new job is a challenge and this is especially true if it is in an organisation undergoing a process of transformation, as is occurring with Ineco, which has also taken on a highly attractive goal as a company.

Personally, I think it is crucial to continually seek out challenges. This applies both professionally and personally. To put it graphically, I don't think it is the same to have twenty years of experience as to have one year repeated twenty times, and that is why I think that evolving needs to be a praxis.

Spanish engineering firms have grown by responding to the development of infrastructure in Spain. Now that the market is mature and companies need to go abroad in the midst of a financial crisis, is there time to react?

Yes, there is time to react. What matters is how we approach going abroad, through the definition and methodical fulfilment of a strategic business plan that must be followed and implemented systematically.

It's important to bear in mind that the transport infrastructure business is in the middle of a process of growth and expansion in many parts of the world. We can

"Ineco has taken on a highly attractive challenge as a business (...) changing the weight of global business in its overall activity"

offer the unique experience that we have gained in Spain over the years. As a result, our past experience is now extremely useful for our clients in other countries.

Does this internationalisation and opening of new markets involve short, medium or long term objectives?

In fact, it involves all three. For one thing, Ineco has had experience in international projects for a number of years. What has changed now is the weight this global business has in its overall activity, supported by the evolution of the company's work in Spain. Of course that means adapting the organisations, processes and people to the needs of different markets. And given that internationalisation is neither temporary nor a passing phase, there are short, medium and long term goals.

And along those lines, what will your priorities be in 2014?

Firstly, to consolidate our international presence. And from an internal perspective, we need to systematise the management system for tenders and projects, which I think is a way of achieving greater efficiency.

There is plenty to do abroad, but the competition is tough. How do you intend to address that at Ineco?

Above all, by focusing on two things: enhancing our understanding of our clients, knowing their needs and expectations, and, at the same time, by harnessing the potential of our experience and our wonderful team.

And domestically, what kinds of developments do you believe await us in the future and in which sectors?

It is true that investment levels have fallen in recent years, but that does not mean that there are no major investment plans still alive. There is the Infrastructure, Transport and Housing Plan from the Public Works Ministry, for example, and business opportunities are available for Ineco in those spheres in which we have first-rate experience and quality.

What opportunities are those?

For example, those linked to the efficiency plans of our clients: we can help them analyse ways to boost revenue, reduce costs and improve profitability. How? One possible approach would be, for example, to conduct a detailed cost analysis to detect where and for what items savings can be achieved, to do benchmarking, that is, to compare what is being done here with solutions in other countries. Another is to analyse the optimisation of maintenance plans, etc. In short, to offer the consultancy that Ineco does so well. In this regard, I believe that our experience and the innovation in our

"With the experience and the innovation in our solutions, we can help boost revenue, reduce costs and improve the profitability of our clients"

FOTO: ELVIRA VILA

A MARKEDLY INTERNATIONAL CAREER

José Manuel Tejera's CV reveals a markedly international personal and professional career: born in Guayaquil to an Ecuadorian mother and Spanish father, his family origins go as far afield as Chile, Belgium and the UK. Tejera has studied and worked in New York, Portugal and Madrid. After receiving an Industrial Engineering degree from the Technical University of Madrid, specialising in automation and electronics, he earned an MBA at IE Business School, where he also works as an associate professor in the field of Operations Management.

solutions can contribute to our success and be leveraged to help our clients in Spain as well as to achieve sustainable international growth.

Another opportunity in Spain is emerging through the processes of privatisation and liberalisation. And of course, any activities relating to the upkeep and maintenance of transport infrastructure.

You have been linked to various multinational companies for almost twenty years. What has arriving at a Spanish public engineering company been like?

I have to say I have received a very warm welcome at Ineco and I have found a lot of energy and enthusiasm. And as to whether I have noticed any differences from other multinational companies in terms of the working atmosphere or methods... I would have to say, not really, since the clients and the key management and team leadership issues are the same.«

A capital plan

Ineco to draw up the Muscat Transport and Mobility Master Plan

By ***itransporte***, with the collaboration of **Jorge Engels,** civil engineer

Muscat, the capital and biggest city of Oman, will receive a public transport master plan to be prepared by Ineco, which will also include proposals for managing the future multimodal network.

The Sultanate of Oman, the fifth largest economy of the Arabian Peninsula, is home to a population of 2.8 million people, of which 28% –some 780,000 people– live in the capital, Muscat, to the north of the country. This is a population that makes extensive use of private vehicles to get around. According to the World Bank, there are 215 vehicles per thousand inhabitants in Oman, a number that has grown over 15% annually over the last decade. The average for the major cities of Asia is 123 vehicles per thousand inhabitants. As a result, accident rates and traffic congestion, two particularly pressing concerns in the urban area of the capital, have both risen.

A general strategy

Meanwhile, in recent years, the Sultanate has made a substantial investments in transport infrastructure as part of the overall strategy of diversifying its economy, which revolves around the production and export of natural gas and oil. Tourism is the cornerstone of this strategy, and Muscat, the economic and administrative heart of the country, plays a predominant role.

It is in this context that the Ministry of Transport and Communications has awarded Ineco the development of the Muscat Public Transport System Master Plan. The plan will analyse the current situation using a multimodal approach, propose the network's design and define the key management strategies, including a revision of existing legislation, the creation of a single transport authority and an analysis of the fare policy. Among the objectives of the plan are environmental sustainability and energy efficiency in the transport system.

Multimodal approach

To date, public transport in the capital and its metropolitan area has been limited to the different types of taxis and minibuses available, along with a few city bus lines operated by a state-owned company. These overland options are complemented by sea transport –of great importance in the Gulf of Oman, with its 3,165 kilometres of coastline– comprising publicly run ferry lines that link Muscat to the region's main ports.

Ineco's team will study all these modes of transport, as well as existing plans to build a rail network in the Sultanate, still under preliminary study. The Omani government has already founded a state railway company to oversee the project, which is initially proposing to build a line over one thousand kilometres long that would hug the coast and link the capital to the United Arab Emirates to the north and Yemen's border to the south. In particular, the possibility of developing a light rail system of medium to high capacity in the Muscat metropolitan area will be taken into account, along with its potential connection to this future rail network.«

Ineco's team will study all modes of transport, as well as existing plans to build a rail network in the Sultanate

SPANISH ENGINEERING FOR OMANI TRANSPORT

In the photograph, the minister of Transport and Communications of Oman, Ahmed bin Mohammed bin Salim al Futaisi, and Ineco president Pablo Vázquez, after signing the contract. The two met in 2013 during the minister's visit to Spain, when he held a meeting with his Spanish counterpart, Ana Pastor, along with the presidents of Aena, Adif and Renfe. In 2012, another Omani delegation toured some of the main Spanish airports. All of these visits were coordinated by Ineco.

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2

3

1 _View of the bay of Muscat.
2 _A typical *souq* or bazaar.
3 _Minarets along the promenade.

The goal of the plan is to design an efficient, modern and high-quality public transport system. Furthermore, the idea is to encourage its use, getting citizens see it as a real alternative to the private car


Minibuses.


Buses.


Ferry.

Regulatory framework and management model

Another crucially important issue to be analysed is the regulatory framework and management system. Ineco's experience in urban transport planning (see inset) has shown that transport systems must come to grips with complex problems stemming from their interrelation with all manner of activities (commercial, industrial and urban), the simultaneous existence of multiple modes of transport, the environmental effects and the repercussions for the mobility of citizens. Many of these problems arise from the inefficiency caused by competing transport modes and from the co-existence of different regulations and administrative levels.

In Muscat, there are a myriad of national and municipal entities and bodies linked to transport or with transport-related competencies. The main body is the Ministry of Transport and Communications, but likewise important are the Muscat City Council, responsible, along with the Royal Police of Oman, for road-building and road-safety, the National Transport Company, which runs the bus service, and the National Ferry Company, among others. Ineco's proposal involves creating a single transport authority that will act as an integrating body and facilitate the coordination of the different agents and the development of strategic transport planning.

The goal of the plan is to design an efficient, modern and high-quality public transport system. Furthermore, the idea is to encourage its use, getting citizens see it as a real alternative to the private car. The strategies proposed will cover all transport modes and be underpinned by an exhaustive data compilation and analysis process, using information gleaned from all the institutions involved, both public and private.«


Traffic signs on an Omani road.


SEA TRANSPORT
Publicly run ferries that link Muscat with the main ports.

Barometer of urban transport in Muscat

The territorial scope of the plan includes the governorate of Muscat (one of 11 into which the Sultanate is divided), which spans an area of 35,000 km^2 and 200 km of coastline. It contains six municipalities or districts: Muscat, Bawshar, As Seeb, Mutrah, Al Amerat and Quriyat. The first three account for over 82% of the region's inhabitants and are the most populous. As for the topic of the study, it focuses on passenger transport and does not include goods or the road network. Currently, urban transport in Muscat offers the following options:

PRIVATE TRANSPORT: **TAXIS AND MINIBUSES**. These are the most widely used transport systems, because of their price and flexibility. There are different types: white and orange taxis, which can move freely throughout the metropolitan area; airport taxis, which can only carry passengers to and from the airport; and on-call limousines and taxis. Minibuses are not authorised to run through residential areas to avoid competition with taxis, and only operate on the main arteries along predetermined routes.

PUBLIC BUS SERVICE. This service is managed by the Oman National Transport Company (ONTC), which owns a fleet numbering 240 vehicles and offers daily long-distance services throughout the country. Its headquarters are based in Ruwi Station, in Muscat. The ONTC also provides cargo services, school transport (the original reason for its creation in 1972), bus hiring and crew transport services for airlines operating at the international airport. As far as city buses, barely two lines operate within the city proper (both from Ruwi), although once there were as many as twenty. Fares are set by the government and are similar to those of private minibuses. This competition, along with the state of the vehicle fleet, are among the causes of the fall in demand.

FERRIES. The National Ferry Company (NFC) offers connections from Muscat to major ports in Oman, such as Shinas, Lima and Khasab, the latter two of which are on the Musandam peninsula. In 2012 the NFC carried 34,782 passengers, three times as many as in 2010, along with twice as many vehicles: 5,568. The fleet, which is to be expanded, currently consists of three fast ferries.«

Experience in urban transport

- **Ineco has extensive experience in urban transport, both in Spain and abroad. The firm has worked with the public transport authorities of large Spanish cities, such as Madrid, Barcelona, Málaga and Valencia, along with those of medium-sized cities like León, Alicante and Zaragoza. Elsewhere in Europe, Ineco has executed projects in Italy (regions of Forli, Bologna and Milan), Serbia (Belgrade) and Estonia (Tallinn).**
- **In South America, Ineco has participated in (or is currently doing so) transport planning projects in Caracas in Venezuela, Rio de Janeiro and São Paulo in Brazil, Mexico City in Mexico, Santiago de Chile in Chile and San José in Costa Rica, among other places. The firm recently completed the development of the National Mobility Plan for Ecuador. Other noteworthy projects include the Kuwait Rail Plan and the Rabat Urban Transport Master Plan in Morocco.**
- **Among the tasks performed are the definition, creation and development of public transport authorities, planning and integration of infrastructure and services, design of terminals and interchange stations, analysis of fare integration, funding framework, environmental assessments, and both technical and economic-financial feasibility studies.**
- **The public transport master plan is not Ineco's first project in Oman. The firm is currently designing flight procedures and navigation charts for the Sultanate's airports. Ineco had also previously drawn up the location study and master plan for the future Musandam Airport as well as an aeronautical study for the new control tower at Muscat Airport.**

Cartão de embarque

Ineco plans the growth of Cape Verde's international airports

By ***itransporte***, with the collaboration of **Andrés Manzanas**, aeronautical engineer and project manager, and **Ángel Toro**, aeronautical engineer posted to Cape Verde

Cape Verde has again trusted in Ineco to plan the growth of its four international airports through to 2030. Air transport is a vital guarantee of both internal mobility and the growth of the tourism sector for this island nation.

Located on the Atlantic coast of Africa, about 500 kilometres from the Senegalese coast and also close to Spanish territory because of their proximity to the Canary Islands, the ten islands that make up Cape Verde have been witness to a dramatic tourism-driven rise in air traffic over the past decade. Ineco first worked in the country in 2004 and has developed master plans for its four international airports. The company has acquired extensive experience in this kind of work (see *itransporte 49*), both in Spain, with its work on Aena's network of 47 airports, and abroad in Kuwait, Colombia and Jamaica. The Cape Verdean authorities are also looking to expand the capacity of their network by adding night operations in Boa Vista and São Vicente, for which reason they have commissioned Ineco to produce two feasibility studies.

Air transport is doubly important in Cape Verde. It facilitates domestic travel for the slightly more than half a million island residents who populate this fragmented archipelago. It also facilitates tourism, which now accounts for 25% of Cape Verde's GDP. The tourism on offer is centred on the archipelago's rich natural heritage, which includes, for example, the third largest colony of sea turtles in the world, vast beaches and unique landscapes.

Sunset at Boa Vista airport.

FOTO: ÁNGEL TORO

Airports under the stars

By **Laura Serrano**, project manager (aeronautical engineer)

The state-owned company Aeroportos e Segurança Aérea of Cape Verde (ASA) commissioned Ineco to prepare two separate analyses of the technical and economic feasibility of night operations at the international airports in Boa Vista and São Vicente. Regarding the hours of operation for Boa Vista, three scenarios were studied: 24-hour all year long, 24-hour only during peak season (July to December), or during peak season from 9:00 am to 2:00 am. At São Vicente airport, two options were considered: 24 hours or on demand.

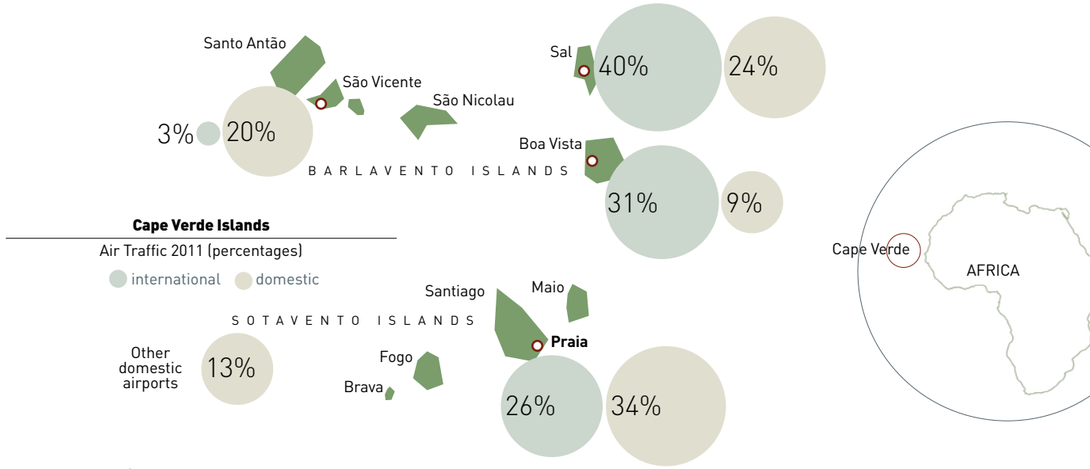
Analyses were done for both airports to determine lighting requirements and the cost of the necessary actions. For Boa Vista airport there was also a study of the instrument approach procedure to runway 03 that would be required, a visual approach manoeuvre known as circling. While aeronautical regulations allow it, it is considered an exceptional procedure and, generally speaking, many operators prohibit it or restrict it under certain conditions. In economic terms, the cost-benefit analysis reveals that opening at night would not be profitable at Boa Vista in any of the proposed scenarios. At São Vicente airport, however, the option of opening on demand all year round would be feasible. In this case, it is estimated that the period needed by ASA to return its investment would be 17 years.«

To handle this increase in visitors, the public company ASA (*Aeroportos e Segurança Aérea*, in Portuguese), which manages a network of seven airports, commissioned a series of expansion activities at the beginning of the decade using the services offered by Ineco (see *itransporte 38*). Following these works, Cape Verde went from having only a single international airport in 2005 to the four currently in operation: those of Sal, São Vicente, Praia (the capital) and Boa Vista, which has the heaviest tourist activity (see *itransporte 7*).

Ineco has developed master plans for all four international airports in Cape Verde

In 2012, ASA again hired Ineco to review and update the aeronautical easements for the entire network and prepare the master plans that will orient the future growth of these four airports through to 2030. The first step was to prepare air traffic forecasts based on historical data from recent years. Using several tried and tested models that take a number of factors into account (socioeconomic data, fleet data and occupancy rates for the airlines operating at each airport, among others), estimates are made for future passenger, operational and cargo development in the short, medium and long terms. As for the proposed works and activities, they are not tied to specific dates, but rather to whether the anticipated traffic volumes are achieved or not. Thus, each master plan is conceived as a custom design that can nevertheless be adapted at any time to changes in demand.«

The four master plans contain proposals for the planning horizons of 2015, 2020, 2025 and 2030, as well as the main actions that would be required beyond then as part of a very long-term strategic vision



Main activities planned

The four documents contain proposals for planning horizons between 2015 and 2030, with intermediate milestones in 2020 and 2025. The main actions that may be required in the very long term, beyond 2030, have also been outlined. Each plan also includes economic estimates for the different actions, an aeronautical easement study, the noise contours and an environmental analysis of the proposed actions.

PRAIA AIRPORT [*NELSON MANDELA*]

It is located three kilometres from the capital, Praia, on the island of Santiago, the largest in the country and where more than half of the population resides. Charles Darwin landed there during his voyage aboard the Beagle. For Praia airport, the master plan forecasts stable traffic growth.

■ **The most immediate task would be the adaptation of the runway strip to 2,220 x 300 metres, in accordance with Annex 14 of the ICAO. It is recommended that, in 2025, the runway be extended by 500 metres to a total length of 2,600 metres, and that the passenger terminal building be enlarged and remodelled. In the very long term, the plan proposes the construction of a taxiway parallel to the runway and the expansion of the apron and the terminal area.**

TRAFFIC FORECASTS - PASSENGERS

	Domestic	Intern.	Total
Short Term (2015)	317,000	268,000	585,000
Horizon **2020**	359,000	355,000	714,000
Horizon **2025**	404,000	433,000	837,000
Horizon **2030**	451,000	500,000	951,000

BOA VISTA AIRPORT [*ARISTIDES PEREIRA*]

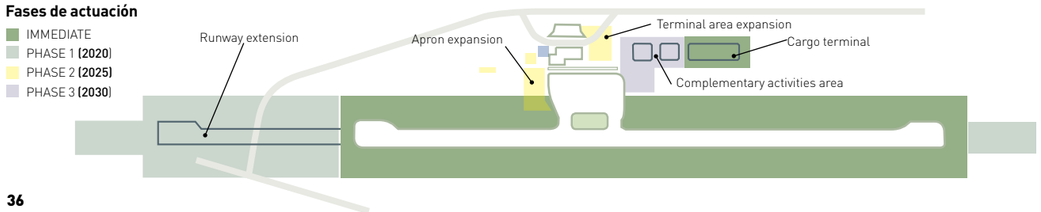
Windsurfing and diving attracts many visitors to this island, which is renowned for its gorgeous scenery, including dunes and long beaches. Indeed, it will be tourism that drives the growth in international traffic at the airport.

■ **In the short term, a new cargo terminal is proposed along with improvements to the facilities in the terminal building. By 2020, the runway will be extended by 700 metres to a total length of 2,800 metres and outfitted with runway end safety areas and an approach lighting system at runway 03 (as recommended in Annex 14 of the ICAO). In 2025 and 2030, several actions are deemed necessary to expand the terminal area and the apron.**

TRAFFIC FORECASTS - PASSENGERS

	Domestic	Intern.	Total
Short Term (2015)	84,000	450,000	534,000
Horizon **2020**	100,000	637,000	737,000
Horizon **2025**	117,000	831,000	948,000
Horizon **2030**	137,000	1,026,000	1,163,000

Fases de actuación



SAL AIRPORT [*AMÍLCAR CABRAL*]

The production and export of salt was the main activity on this island until the mid-19th century. The old salt flats have now become a tourist attraction, along with a large beach that is eight kilometres long. Forecasts indicate that the arrival of international tourists will be one of the main factors in boosting traffic at the airport.

■ **According to the master plan, the airfield has enough capacity to handle the expected traffic, but would improve its operations with a new rapid exit taxiway for domestic traffic. In the short term, the definition of runway end safety areas is recommended, along with the construction of an isolated aircraft parking position and the relocation of the ARFF building. The expansion of the terminal building and maintenance area is proposed for between 2020 and 2025, while for 2030 it is proposed that the general aviation facilities be grouped together, among other actions. In the maximum development possible, of particular note is the proposed construction of a second parallel runway which would be 3,000 metres in length.**

TRAFFIC FORECASTS - PASSENGERS

	Domestic	Intern.	Total
Short Term (2015)	226,000	492,000	718,000
Horizon **2020**	272,000	688,000	960,000
Horizon **2025**	324,000	886,000	1,210,000
Horizon **2030**	383,000	1,080,000	1,463,000

AIRPORT OF SÃO VICENTE [*CESÁRIA ÉVORA*]

In March 2012, the airport, also known as São Pedro, was renamed after the late singer Cesária Évora, who had passed away in December 2011. She was born in Mindelo, the island's capital, renowned for its cultural and leisure activities, which include a colourful carnival. Up to 2030, no significant growth is anticipated either domestic or international traffic.

■ **A new control tower, the adaptation of the runway strip and the apron II pavement rehabilitation are some of the actions recommended in the short term. Five years later, the proposal is for the expansion of the ARFF (Aircraft Rescue and Fire Fighting Service) building, the construction of a roadway directly linked with the runway to reduce response time in emergencies, and the installation of an approach lighting system for night operations. Between 2025 and 2030, it is anticipated that the terminal building will be expanded and the apron enlarged, with a specific parking area for ground support equipment.**

TRAFFIC FORECASTS - PASSENGERS

	Domestic	Intern.	Total
Short Term (2015)	181,000	59,000	240,000
Horizon **2020**	202,000	75,000	277,000
Horizon **2025**	224,000	87,000	311,000
Horizon **2030**	246,000	95,000	341,000

From grocer's to duty-free shop

El Salvador's airport will renew its entire business strategy

By ***itransporte***, with the collaboration of **Óscar Muñoz,** aeronautical engineer and **Alberto Calderón,** expert in commercial development

A CHANGE OF PERSPECTIVE

The current arrangement of shops is somewhat disjointed, leaving an old-fashioned, disparate impression on visitors. The idea is to adopt a new design for the units and attract international fashion, technology and food service brands, as well as to offer products and include elements that reinforce the country's identity.

Under commission by a United Nations agency, Ineco has proposed a new commercial policy to El Salvador's airport to completely transform all business spaces, from the shops to the cargo area. The airport aims thereby to maximise non-aeronautical revenues, which will devote to expansion and improvement works.

Airports are not just runways, they are everything that makes a passenger comfortable." So said United Nations Airport Management Specialist Gabriel Gurméndez during the public presentation, in July 2013, of El Salvador International Airport's new commercial policy. Ineco has been commissioned to design the policy with an eye to three main objectives: maximising revenue, improving the country's tourism image and providing quality and comfort for passengers, who totalled 2.1 million in 2012 and are growing at a rate of 100,000 per year.

For passengers, the ability to acquire a variety of products from a wide range of suppliers in an attractive environment is part of the comfort experience. Furthermore, running commercial spaces –including logistical and urban spaces– is an increasingly important source of income for airports. According to the Airports Council International (ACI), "non-aeronautical revenues", that is, those that do not derive from the fees paid by the airlines for using the aeronautical and airport facilities and services, already account for 50% or more of total revenues. Against the current 15.6%, the former is the percentage that the Salvadorean airport aims to reach as it prepares to embrace public-private management for the first time as part of its full modernisation and expansion process.

The managing state agency, the Autonomous Executive Port Commission (CEPA, per its Spanish initials), receives advice from the United Nations through UNOPS, the United Nations Office for Projects and Services, which held an international tender to develop a new business strategy. Ineco was selected from among eight other companies and drafted its proposal, which involves not only reforming and modernising the image and the arrangement of the available units, but also changing the paradigm and management of both the passenger and cargo terminals.

A new business concept

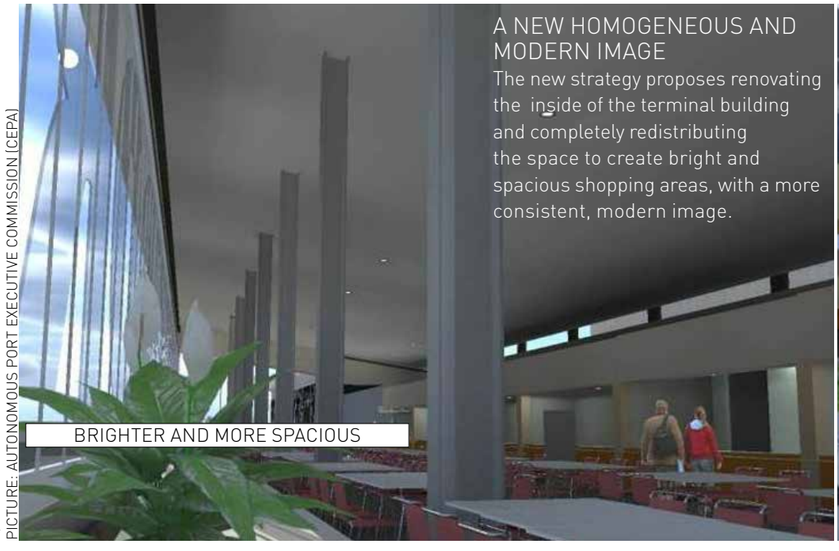
Currently, the airport has 165 companies and concessionaires and 495 establishments. Analysis by Ineco, however, reveals that this fragmentation of the space does not translate into a diversity of shopping opportunities. In fact, passenger surveys found that travellers would like more fashion, electronics and handicrafts stores, as well as fast-food and local cuisine outlets. In parallel, the study points to a disorderly arrangement. An old-fashioned, jumbled and scarcely attractive shop image is coupled with an indoor space possessing scant natural light, reduced commercial hours and low rents. To improve these aspects, the new strategy proposes reforming the inside of the terminal building and completely redistributing the space, »

EL SALVADOR HANDICRAFTS

PHOTO: DEVELOPMENT CENTRE FOR MICRO AND SMALL ENTERPRISES

DUTY-FREE WALKTHROUGH

PHOTO: WORLD DUTY FREE GROUP



BRIGHTER AND MORE SPACIOUS

A NEW HOMOGENEOUS AND MODERN IMAGE

The new strategy proposes renovating the inside of the terminal building and completely redistributing the space to create bright and spacious shopping areas, with a more consistent, modern image.

PICTURE: AUTONOMOUS PORT EXECUTIVE COMMISSION (CEPA)

VIEW OF THE RUNWAY FROM INSIDE THE AIRPORT

PICTURE: AUTONOMOUS PORT EXECUTIVE COMMISSION (CEPA)

Commercial development is integrated into the expansion plans of El Salvador's airport, which will reach 3 million passengers in 2022 and has been undergoing various modernisation initiatives since 2012

AIRPORT GROWTH AND EXPANSION PLANS

In addition to the new directives on business operations, Ineco's study also analyses the cargo area, for which it proposes to create a new terminal, one logistics area for air cargo and another for ground cargo, a free-trade zone and the enlargement of airline catering facilities, along with a new hotel and a petrol station.

to create a more spacious and well-lit shopping area with a more uniform and modern appearance.

A complete overhaul

It is thus suggested that commercial experiences and practices at other Latin American airports be applied at the El Salvador airport, such as a duty-free walk-through, the placement of shops in the arrivals lounge, a selection of internationally recognised brands (fashion, technology, catering, etc.) and the incorporation of elements that reinforce the country's identity. The plan also advocates a change in the management system, increasing the term of the concession to a minimum of three years. According to CEPA, this measure would provide concessionaires with "more economic and legal stability". Business operations are not limited to just airport shops. Ineco's study also analyses the cargo area, for which it proposes to create a new terminal, one logistics area for air cargo and another for ground cargo, a free-trade zone and the enlargement of airline catering facilities, as well as a new hotel and petrol station.

Commercial development is thus integrated into the plans for growth and expansion at El Salvador's airport, which was opened in 1980. Traffic growth is forecast to reach 3 million passengers in 2022. Since 2012, different modernisation initiatives have been undertaken, including overlaying the main runway and renovating the passenger boarding bridges and air conditioning equipment, among other items. It is also forecast that the newly adopted law on public-private partnership to finance the expansion plans will be applied for the first time in the country.«

The new policy requires changes in the management system, such as increasing the term of commercial concessions

The airport, at a glance

El Salvador's international airport is located in the southern-central part of the country, 50 kilometres from the capital, in the town of San Luis Talpa, Department of Comalapa. To date it has been run on behalf of the state by CEPA, which also manages Illopango, the country's other airport –now dedicated to military and charter aviation–, the rail network and the major ports of Acajutla and La Unión.

The airport has one runway measuring 3,200 metres and another measuring 800 metres in length, the latter currently only used for long-term aircraft parking.

The terminal building has an apron with 17 parking spaces and the cargo terminal has another three aprons, along with maintenance facilities with capacity for seven aircraft. A dozen airlines operate at the airport including: Avianca-TACA, American Airlines, Continental Airlines, Delta Airlines, Iberia, Spirit and Copa.

Welcome, EU member state number 28

Ineco to participate in the rehabilitation of a railway section in Croatia

By ***itransporte***, with the collaboration of **Fernando Tejedor**, civil engineer and project manager, **Alejandro Fernández**, economist, and **Jelena Bjelajac**, expert in international tenders

An international consortium composed of the Spanish companies Ineco and Typsa, along with French firm Egis Rail and Croatian firm IPZ, was awarded the contract for modernising and renovating 80.5 kilometres of railway in the Republic of Croatia.

Croatia became member number 28 of the European Union on 1 July 2013. The rotating president of the Council of the European Union, Dalia Grybauskaite of Lithuania, presents a commemorative shirt to Ivo Josipovic, the president of Croatia.

Dubrovnik, national tourist hub.

View of downtown Zagreb, the capital.

The 10,215,000 cost of the contract was funded by the European Commission within the framework of the IPA (Instrument for Pre-Accession Assistance). This is the programme through which the Commission funded the bulk of aid for Croatia prior to its entry into the EU in 2013. Croatia's strategic location makes it a key passageway, linking eastern and

This is the biggest railway design project ever financed in Croatia by EU aid

northern Europe with the Balkans, the Mediterranean, the Adriatic and Asia. This particular stretch runs from Dugo Selo to Novska, an international line that complements priority European corridors no. 5 (Venice-Budapest-Kiev), no. 10 (Salzburg-Ljubljana-Zagreb-Belgrade-Thessaloniki) and no. 7, which runs along the Danube, as well as their branches.

EU forecasts

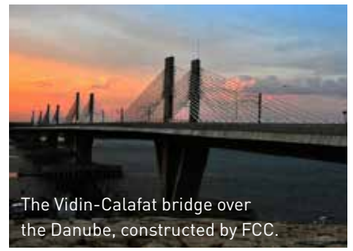
By 2020 the European Union expects to have a network with 94,000 kilometres of railway lines in operation, 12,300 kilometres of which will have been newly constructed. The goal is to "weave" a comprehensive European network of roads and railways to drastically reduce transit times between the Member States and help enhance the movement of goods and people throughout the Union. In addition to improving the main transport axes, such as this line in the Republic of Croatia (a fully acceded EU member since 1 July 2013), the EU seeks to encourage the economic development of a region with enormous growth potential.

Croatia's geographical location also makes it an attractive route for exporting merchandise to Asian markets.«

Spanish presence in the Balkans

■ In 2009, Ineco implemented a similar project to modernise the Vidin-Sofia line in Bulgaria, another vital stretch in the axes linking northern Europe to the Black Sea, and the Mediterranean to Asia (see *itransporte 29*). Years earlier, between 2004 and 2010, Ineco participated in the modernisation of Serbia's infrastructure, specifically in the design and project management of the first light rail line in Belgrade. The Spanish engineering company Typsa, for its part, has prior experience working in Croatia, where it supervised the renovation of the Zagreb Central Station signal box between 2010 and 2012, as well as the works on the Vinkovci-Tovanik section from 2008 to 2011.

■ Other Spanish companies aside from Ineco and Typsa are also working to modernise the Croatian network. Of particular note among these is the consortium composed of Acciona Ingeniería, Ardanuy and Idom, which, together with the Croatian firm ZPD, have been awarded other railway projects funded by the Commission (Vinkovci-Vukovar).



The Vidin-Calafat bridge over the Danube, constructed by FCC.

■ Eptisa opened a local branch in Croatia in early 2012, although the company has been working in Croatia since 2004.

■ According to FEACO, the European Federation of Management Consultancies Associations, Spanish firms are the third most present, after Germany and the UK, in the country's transport infrastructure sector. Over the next few years, now as a member state of the European Union and beneficiary of € 1.1bn from the EU Cohesion Fund, Croatia will continue to develop and modernise its infrastructure, especially as related to energy, railways, maritime transport and environmental protection. It will also continue to receive funding from the World Bank (WB), the European Bank for Reconstruction and Development (EBRD) and the European Investment Bank (EIB).

LIGHT RAIL IN BELGRADE, SERBIA
Ineco designed Line 1 of the Belgrade light rail between 2004 and 2010.

MODERNISATION OF THE VIDIN-SOFIA LINE, BULGARIA
A joint venture between five European companies, Ineco and Iberinsa among them, undertook the financial and feasibility studies for this project.

The single track will be doubled, electrified and equipped with ERTMS. The stations at Dugo Selo, Ivanić-Grad, Popovača, Kutina and Novska will be reconstructed. Once completed, the top speed will be 160 kph

A 21ST CENTURY RAILWAY LINE

Track duplication and other improvements

The new 3-year contract includes the track renovation and duplication projects, involving the demand, cost-benefit, geotechnical and topographical studies, as well as the platform, structure, track, station, electrification, signalling and communications projects for the whole alignment. The consortium will design and plan the reconstruction of stations such as those at Dugo Selo, Ivanić-Grad, Popovača, Kutina and Novska. The contract also includes projects to eliminate all level crossings and implement ERTMS along the entire line. A new 12-kilometre bypass to cross a swamp between Kutina and Lipovljani is included in the corridor project. Ineco's work will be focused on technical management and the development of all the railway systems.

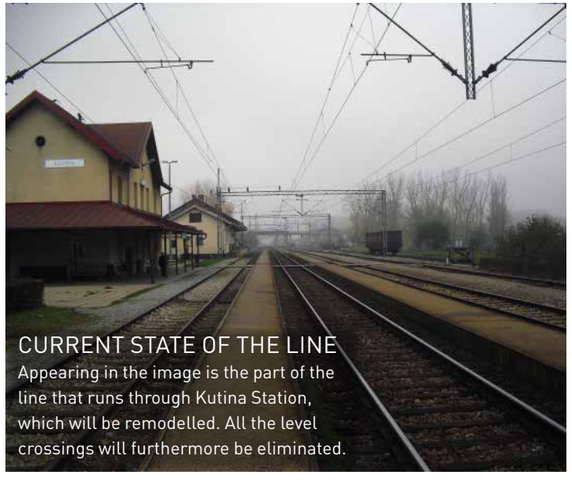
One must bear in mind the difficulty of working on a single-track line with signalling systems inherited from the Soviet era. This will doubtlessly be the biggest challenge in this project. After the new line enters service, the maximum speed will be 160 kph and train frequency will increase, helping to reduce congestion on Croatia's roads.

With a population of 4.2 million, Croatia's tourism and services sectors are burgeoning. Renovation of the country's railway structures was one of the hallmarks of the 2007-2013 Transport Operational Plan, under which the Croatian government informed the Commission of its priorities. With this and other similar projects funded by the EU, Croatia seeks to modernise the sections of its railway network that pertain to the Trans-

Ineco's work will be focused on technical management and the development of all the railway systems

European Transport Networks. At the same time, technical and operational standards are being harmonised, trade with the EU is improving and a more sustainable and balanced network is being created.«

COMPREHENSIVE RENOVATION
The contract includes projects for the comprehensive renovation of the line, including signalling and communications. Appearing in the image is Inmaculada López of Ineco.



CURRENT STATE OF THE LINE
Appearing in the image is the part of the line that runs through Kutina Station, which will be remodelled. All the level crossings will furthermore be eliminated.

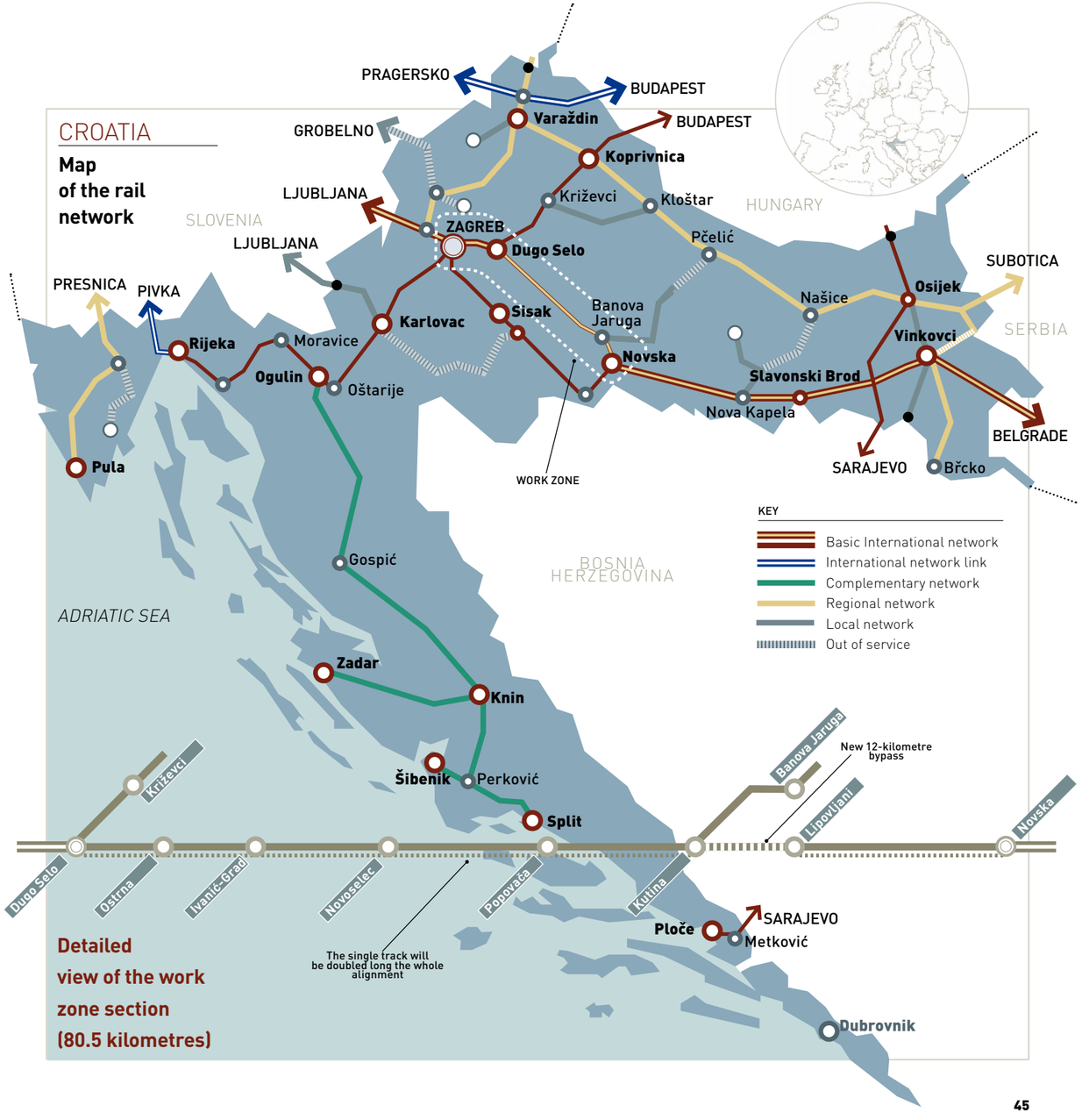


PHOTO 1, from left to right: **Fernando Tejedor**, head of alignment for the HS2 Birmingham Delta Junction Project with **Francisco Luque** and **Iker Garteizgogeaskoa**, engineers from the winning team. **PHOTO 2**, **Fernando Tejedor** (centre), head of railway alignment, receives the prize from the executives of Bentley Systems. **PHOTO 3,** presentation by **Pablo Ramos**.

14 RAILWAY JUNCTION INFOGRAPHICS

Ineco produced a D + Y shaped junction, forming the basis for a diverse range of easily understood 3D graphics, with virtual images of an infrastructure in total harmony with its surroundings, as can be seen in this image. Ineco experts used tools developed by Bentley Systems, a company specialising in software suites for the development of sustainable infrastructure.

A brilliant inspiration

Ineco receives an award for its work on the HS2 high speed line

By *itransporte*

The design of the HS2 high speed Birmingham Delta Junction developed by Ineco has won Bentley Systems' 2013 Be Inspired Awards in the 'Railways and Transit Innovation' category. The award reflects international recognition for the excellent project developed by Ineco's railway experts.

Birmingham Delta Junction is a "Y" on the section of the future London-Birmingham high speed line that was awarded to Ineco and Capita Symonds. Located 14 kilometres from Birmingham, the junction, which links the main line to the branches to and from Birmingham and Leeds, contains a wide range of highly complex structures and sections. This job is part of phase 1 of the project on the Country North Section, a 75-kilometre stretch of double-track with a maximum design speed of 400 kph.

Six independent panels made up of Bentley users and recognised industry leaders chose the finalists from a series of candidates proposed by organisations from 43 countries. The purpose of the award is to recognise work that enhances and sustains the world's infrastructure. At the award ceremony, held in London in October, Iker Garteizgogeaskoa, Fernando Tejedor and Francisco Luque from the Railway Projects team and Pablo Ramos, director of the HS2 Project in Ineco, gave a presentation highlighting the virtues of a full 3D design capable of forming the basis for a future Building Information Model (BIM), very much in demand in today's infrastructure market.

21 critical points

In a scant nine kilometres this junction contains 21 critical points. That is because this section of the line runs over forks, rivers, canals, highways, railways and roads. Ineco used the following tools developed by Bentley Systems to find the optimal solution for this infrastructure's design: Power Rail Track, MicroStation and ProjectWise were used to create numerous proposals that have enabled project development costs to be reduced by 30%. Among their many other advantages, they allow for drawings to be easily displayed from all possible angles. The design process generated as many as 160 different proposals for the alignment, 190 proposals for turnouts locations and a total of 94 terrain models. Another added bonus was that teams located in London, Wales, Madrid and Seville could work together with the same standards and regulations as the owner of the tool, HS2. Lastly, ProjectWise classified and ordered all the project documentation and optimised access to the information.«

A 'tapa': fried egg in a crisp filo pastry with bacon and fresh tomato sauce.

PHOTO: WWW.ASADORERRAZKI.COM

A taste of Spain

Spanish cuisine has broad international appeal

By ***itransporte***

Whether in the form of fresh food or *haute cuisine*, gastronomy is one of the great attractions of Spain and a highlight among its exports. According to the Ministry of Agriculture, in 2012 foreign sales of food products accounted for 15.5% of the total, up 9.2% on the previous year. Among them, olive oil –mainly extra virgin, the purest and highest-quality type available– indisputably ranks first in both volume and economic value: half of European production and 40% of world production comes from Spain's 300 million olive trees.

Spain is the second largest supplier of fresh fruit and vegetable products in the world, according to UN statistics for the 2009-2012 period. Oranges, lemons and strawberries particularly stand out among fruits, but let's not forget stone fruits, custard apples and melons, of which Spain is the biggest exporter in the world. The same is true for cucumbers, along with other vegetables such as tomatoes and peppers.

When it comes to meat, Spain is the fourth largest producer in the world of pork and the second in the European Union. Among the many existing varieties, 'serrano' ham, in particular of the kind made from 'ibérico' pigs raised outdoors on acorns (called 'Ibérico ham'), is one of the hallmarks of Spanish gastronomy. According to industry figures, foreign sales of this delicacy are growing every year –up 8.7% in 2012– and, while Germany, France and Portugal are the biggest buyers, Spanish cured ham is now consumed in over a hundred countries.

Spain exports one quarter of all the food it produces, which makes it the eighth largest world food exporter. The agrifood sector contributes 8.3% to Spain's GDP and employs 2.4 million people, according to figures from the Ministry of Agriculture. It is at the tables of its famous restaurants, however, where, in recent years, the wealth of Spanish pantries has truly been making waves. Traditional dishes and ingredients have been presented in highly innovative ways that have earned them international acclaim.

STARS OF THE DINING TABLE. Spain's diverse cuisine is traditionally based on the Mediterranean diet, the main ingredients of which are olive oil, fresh vegetables and pulses, pasta, rice, fish and moderate quantities of red meat and poultry. Fine dining is one of the activities most highly valued by the 60.6 million tourists that Spain received in 2013, according to official data from Turespaña. In parallel, Spain's high-end signature cuisine has achieved an unprecedented international presence.

In 2013, the UK magazine *Restaurant* awarded a Spanish restaurant in Catalonia, **El Celler de Can Roca**, what is widely considered the equivalent of the Oscar for chefs: first place on its ranking of the hundred best restaurants in the world. This position had previously been occupied for five years by **El Bulli**, run by Ferran Adrià, which has since closed. Adrià plans to reopen the space this year, having converted it into a centre for international culinary research under the name of **El Bulli Foundation**. The list of the "world's best restaurants" features seven Spanish establishments –all occupying distinguished positions– along with 12 from the US and a similar number from France, 16 throughout Asia and 8 in South America.

PHOTO: MINISTRY OF AGRICULTURE

Spain is the fifth highest-ranking country in the world in terms of number of stars awarded by the French *Michelin Guide*, distributed among 170 restaurants. The Madrid restaurant **DiverXo**, run by the young chef David Muñoz, is the most recent addition to the group of eight restaurants awarded the highest honour: three stars. The *Michelin Guide* has also awarded one or more stars to numerous restaurants throughout Spain. In Madrid, there is **Ramón Freixa**, run by the eponymous chef, **Santceloni**, run by Óscar Velasco, **Gastro**, run by Sergi Arola, **La Terraza del Casino**, run by Paco Roncero, and **El Club Allard**, run by Diego Guerrero, who will be opening a new restaurant in 2014. In Barcelona, standouts include **Sant Pau** (in nearby Sant Pol de Mar), run by Carme Ruscalleda, **Moments**, run by Raúl Balam, **Enoteca**, run by Paco Pérez, **Lasarte**, run by Martín Berasategui, and **ABaC**, run by Jordi Cruz. Also in Catalonia, located in the province of Girona are **Les Cols** in Olot, run by Fina Puigdevall and **Miramar**, in Llançá, run by Paco Pérez.

In the Basque Country we find **Azurmendi**, in Larrabetzu (Biscay), run by Eneko Atxa, and **Mugaritz**, in Rentería (Gipuzkoa), run by Andoni Luis Aduriz. Meanwhile, the city of San Sebastián is home to **Akelarre**, run by Pedro Subijana, and **Arzak** (No. 8 in the *Restaurant* magazine list), run by Juan Mari and Elena Arzak. The list continues with **Quique Dacosta**, in Denia (Alicante), **Dani García** at the Puente Romano hotel in Marbella (Málaga), **Atrio**, run by Toño Pérez, in Cáceres, **El Portal de Echaurren**, run by Francis Paniego in Ezcaray (La Rioja), **MB**, on the island of Tenerife (Canary Islands), **Aponiente**, run by Ángel León, in El Puerto de Santa María (Cádiz), and many others.

'TAPAS' AROUND THE WORLD. In addition to its products, Spanish cuisine has exported a genuinely home-grown culinary concept: 'tapas'. The origins of these small portions of food, dating back at least to the 19th century, are simple: although their history is somewhat uncertain, it appears to be related to the custom at inns and taverns of placing slices of bread, cheese and cold meat on top of glasses or pitchers, and serving olives or other appetisers over these 'tapas' (literally, 'covers'). Whatever the case may be, today, whether as an *hors d'oeuvre*, or an alternative to lunch or dinner, they have become a whole genre in and of themselves and come in all manner of formats, from pickled foods, cold meats and cheeses to miniature portions of traditional dishes, like paella or tortilla, and even of the most sophisticated contemporary dishes.

Among the pioneers in exporting 'tapas' was the Spanish chef José Andrés at his restaurant **Jaleo** in Washington D.C. (USA), which opened in 1993. More popular and aimed at the average consumer are those restaurant franchises that focus on serving 'tapas', or 'pinchos', as they are known in some parts of northern Spain. Among the most successful of these are **Lizarran**, owned by the Comess Group, which is present in ten countries on five continents, and the brands **Cervecería La Sureña** and **100 Montaditos**, both owned by the Restalia group, which runs 400 establishments in Spain, the USA, Mexico, Colombia, Portugal and Italy. The trend toward expansion is continuing. According to the Spanish Association of Franchisors' annual report for 2013, 47 Spanish hospitality companies were registered in 53 countries around the world, running a total of 1,444 restaurants, which was 25 more than the previous year.«

The agrifood sector contributes 8.3% to Spain's GDP and employs 2.4 million people.

Thanksgiving turkey. CASCAJARES

At home...

Spanish companies are taking their products around the globe. In 2011, Cascajares, a firm based in Palencia, opened a factory in Quebec, Canada, where it markets its gourmet products in North America: capon, suckling pig, roast lamb, game birds and even Thanksgiving turkey. Meanwhile, the Salamanca-based firm Embutidos Fermín was the first company authorised to export cured 'serrano' ham to the United States. Another example is that of Cárnicas Joselito, which exports its acorn-fed 'ibérico' ham to 50 countries.

The kitchen at **El Celler de Can Roca**, voted best restaurant in the world in 2013.

PHOTO: EL CELLER DE CAN ROCA

Cien Montaditos in Rome.

Spain is the second largest supplier of fresh fruit and vegetables in the world.

PHOTO: NARANJAS PALAU

Chef José Andrés at **Jaleo**.

Juan Mari Arzak and his daughter Elena Arzak (best female chef in the world 2012), at the 2013 *Restaurant* magazine awards.

PHOTO: THE WORLD'S 50 BEST RESTAURANTS

... or at the restaurant

Some of the most renowned Spanish chefs have founded establishments in major cities around the world: Carme Ruscalleda (seven Michelin stars in total) has a branch of her Sant Pau restaurant in Tokyo. Paco Roncero, a disciple of Ferran Adrià, has opened View 62 in Hong Kong, where his cuisine based around olive oil is the star of the show. London has its Ametsa, run by Juan Mari Arzak. Washington D.C. has Jaleo, run by the Asturian José Andrés. In New York, there is the newly-opened Manzanilla, run by Dani García.

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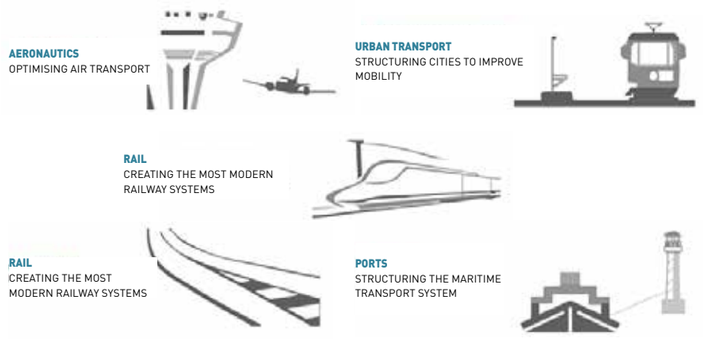
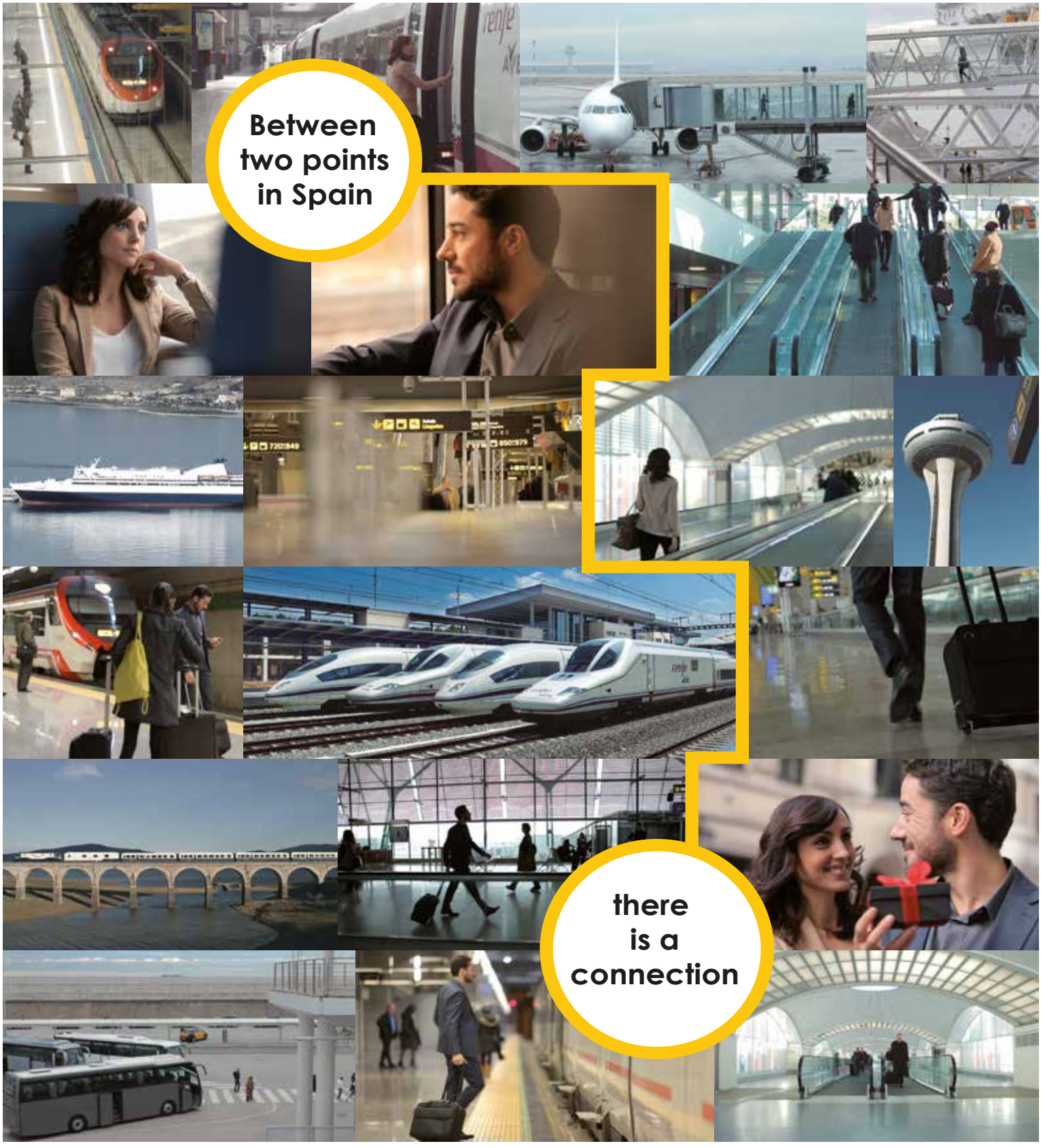
A 40 COUNTRIES OVER

High Speed Railway between Madinah and Makkah | Master Plan for Kuwait International Airport | Railway between Istanbul and Ankara | Guadalajara–Colima Highway in Mexico | Control Tower in Eldorado, Bogota | Strategic Plan for Railway Freight Transport in Spain | Airports Plan in Nepal | National Transport Plan of Algeria | Aena Airports, Spain | Improvement of the Railway Network in Lithuania | Snow Plan for Heathrow Airport | Road Improvement in Ecuador | Master Plan for Sangster Airport, Jamaica | Coordination of the São Paulo Ring Road | Improvements to the Moroccan Air Navigation System | New Industrial Complex in Shadadiya, Kuwait | Studies for the High Speed Railway between Haldia and Howrah, India | Tram Line 4 in Tallinn, Estonia | Transport Plan in Costa Rica | Consultancy for Luanda Airport...



America	Europe	Africa	Middle East	Asia
Mexico	United Kingdom	Cape Verde	Saudi Arabia	India
Colombia	Turkey	Algeria	Kuwait	Philippines
Venezuela	Italy	Morocco	Qatar	Nepal
Brazil	Portugal	Mauritania	Oman	Singapore
Argentina	Serbia	Namibia	UAE	
Panama	Poland	Ethiopia	Jordan	
Costa Rica	Norway	Mali		
Jamaica	Lithuania	Egypt		
Peru	Bulgaria	Angola		
Chile	Estonia			
Ecuador	Denmark			
Bolivia	Belgium			
	Spain			



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