

PAST, PRESENT AND FUTURE OF THE ANDALUSIAN AERONAUTICAL CLUSTER

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Aeronautic industry in the Andalusian region (Southern Spain) is a highly developed and mature industrial sector. The cluster has established cooperation activities since its origin, evolving to the current Extended Enterprise structure. Activities are coordinated under stable long-term collaboration agreements in the supply chain, mainly under a subcontracting form. The business challenge is to exploit the key skills of the auxiliary companies by promoting joint offers to the main contractors to take on advanced engineering workpackages in the production chain which involve more risks in a more reliable environment.

This paper is focused on ongoing initiatives to drive the evolution of the cluster towards the advanced collaborative paradigm, and consolidate the Spanish aerospace sector on the European market of military transport aircraft.

1 INTRODUCTION

Aerospace production in Andalusia dates back to the 1930s and nowadays the cluster is composed of a few major factories (EADS-CASA, AIRBUS and GAMESA), together with 43 SMEs. Most of them are located in the provinces of Seville and Cadiz. It is being promoted by the Regional Government as a competitive instrument towards the consolidation of the aerospace Spanish sector on the European market of military transport aircraft.

The regional aeronautic industry boasts a splendid situation with projects that strengthen the importance of Andalusia as one of the country's main aerospace production regions: design and production of 10% of the structural components of the A380 program, final assembly of the Eurofighter, Tiger helicopters assembly, production of the Boeing "737 Dreamliner" radder, together with proprietary aircrafts production. The cluster is focused on the production of components and engineering processes involved in the all-new A400M military aircraft. It will have its first flight from Seville's San Pablo Airport, after being assembled at EADS CASA's factory, the third largest Airbus production plant in the world with an investment of 340M€. Besides

the assembly line, the excellence centre in sheet metal production and composites are the key services provided to the aeronautic industry with outstanding potential impact in the global market.

The cluster coordinates their activities under stable long-term collaboration agreements, mainly under a subcontracting form, covering all the processes in the supply chain: engineering, planning, purchases, production, sales, and stock management. They currently operate under an Extended Enterprise model, with common supporting ICT infrastructure, together with methodologies, services, and tools for facilitating the cooperation. The market trends drive the dynamization of the local cluster, by providing attractive business opportunities. In this scenario, the business challenge is to exploit the key skills of the auxiliary companies by promoting joint activities and thus enable them to take on advanced engineering phases in the production chain which involve more risks in a more reliable environment.

This is a key strategy of the Regional Development Agency, which is the local motor of the cluster organisation and infrastructure, providing RTD instruments and funding resources to reinforce the cooperation initiative. This research provides an overview of ongoing projects and planned strategy within the cluster, in order to evolve towards the advanced collaborative paradigm, and thus to improve the competitiveness in the global aeronautic business market.

2 EXISTING THEORIES AND WORK

The factors which drive industry cluster development and growth are a subject of debate in the literature. Competition [Porter 1990] is a driving force behind cluster development, as happened in Silicon Valley. Clustering is a dynamic process, and as one competitive firm grows, it generates demand for other related industries. This, in turn, leads to new business spin-offs, stimulates R&D, and forces the introduction of new skills and services.

Face-to-face interaction is also cited in several of the sources as a critical factor in cluster development [Doeringer, Terkla 1995, Rosenfeld 1997]. Local proximity to firms in all aspects of the production process, such as the suppliers, machine builders, assemblers, distributors, and final customers allows the cooperating firms to adopt new technology and innovations rapidly, therefore increasing the overall efficiency of the production process.

The EC fifth and sixth framework programmes encourage cross-border co-operation. The AeroSME project, a joint activity of ASD (AeroSpace and Defence Industries Association of Europe) and the European Commission, was launched to support the participation of SMEs in the FP5th. It was also designed to facilitate co-operation among SMEs, between SMEs and large companies, and with other aeronautics related bodies in order to improve SMEs position in the supply chain and networking opportunities.

The development of collaborative working models and approaches is emerging as a strategic objective promoted by research programmes at national and European level. Some previous outstanding initiatives supported by the 5th and 6th EC Framework

Program are VOSTER, ALIVE, VIVE, CE-NET. Furthermore, ECOLEAD foresees that in ten years time most enterprises, specially SMEs, will be part of one or more sustainable collaborative networks and is aimed at developing technologies for such collaborative organisations.

In the specific domain of the aeronautical sector, VIVACE project defines methods and deliver processes, tools and systems recommendations which support the integrated operations in the Aeronautical supply chain. This project has produced VIBES (VIVACE Interactive Business Environment Simulator), a tool for investigating the future scenarios concepts that are most relevant to the key players in the industry. VIVACE has defined a Hub vision, specifying how a number of “services” provide collaborative and shared data functionality to a set of partners working together [Farr, 2005].

2.1 Previous cooperation experiences

The first cooperation initiative took place in 1990, when the main Andalusian subcontractors joint together in the “**ATESAER**” association with marketing purposes.

In the period 1994-2000, “**ANDALUCÍA AEROESPACIAL SA**” was constituted as a Virtual Enterprise bringing together public bodies and subcontractors, with the aim of sharing competences and resources in order to access to higher market opportunities in the aeronautical sector otherwise unavailable own due to their limited technical and financial capabilities. The contracts achieved by the built Virtual Organisations with Boeing and Dornier became the rate of 40% of the workload in the sector.

After the disclosure of the previous initiative, in 2002 **HELICE FOUNDATION** and **HELICE.NET** were launched by the Regional Development Agency in Andalusia, with the aim of fostering collaboration activities and improve their competitiveness in the European aeronautic market.

AEROPOLIS is a strategic project from the Regional Government, providing physical infrastructures in 580.000 m² to allocate the cluster members in the surrounding area of EADS-CASA in Sevilla.

The **Andalusian Aeronautical Forum** (promoted by the Aeronautic Engineering Association, Engineering University of Seville), brings together these professionals in a heterogeneous community sharing knowledge, experiences, and promoting discussions about the Aeronautic industry in the region.

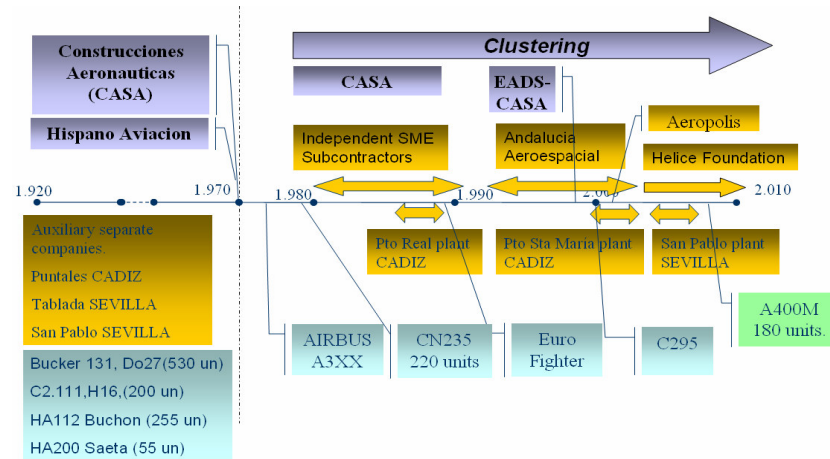


Figure 1. Cooperation history and experiences

2.2 Helice Foundation. Virtual Enterprise in the Andalusian aeronautical sector

The Virtual Breeding Environment (ECOLEAD project) in the Andalusian aeronautic cluster is built on the **Helice Foundation** legal form, a Non Making Profit Corporation owned by **39 entities**, linking aeronautic companies (EADS-CASA and subcontractors), supporting entities (Universities, Research Centres and Regional Government) and strategic partners with the aim to increase process efficiency and business opportunities while fostering innovation in a sustainable structure within the cluster. The motor and infrastructure for Helice Foundation stem from the Regional Development Agency in its initiative to reinforce the collaborative paradigm.

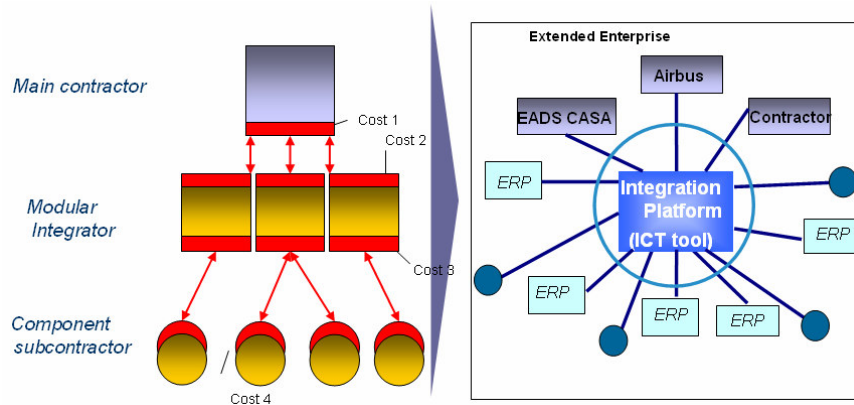


Figure 2: Helice Foundation Structure and challenges

The aim is to organize all the entities related to the aeronautic sector and conduct the activities in the Extended Enterprise under the guidance of the Foundation, providing

methodologies, services, and tools for facilitating the cooperation. This structure is aimed at enabling the reduction of times and costs through the integration and synchronization of the processes by providing:

- Common exploitation of complementary resources and capacities.
- Systematic relationships with auxiliary companies
- Creation of a Knowledge Transfer Network

2.3 Helice.net: ICT collaboration infrastructure

HELICE.NET is the ICT infrastructure supporting the collaboration within the cluster and the delivery of supplied parts. The initiative has been launched Helice Foundation and promoted by the Regional Government and EADS-CASA. The solution is built by two main constituent blocks:

- SAPORTAL provides e-services for implementation and monitoring the collaborative operations in the network, from the order to the client delivery.
- SAPECMA is a resource planner enabling companies to integrate and synchronize internal and collaborative process management.

3 RESEARCH APPROACH

The design and implementation of the advanced cooperation scenario is being carried out with the support of European Initiatives (ECOLEAD) and national programs ('Programme for Innovation and Modernisation of Andalusia' (PIMA 2005-2010)0'. The plan is conceived in different conceptual phases, in order to introduce innovative processes and ICT platforms, with the goal of fostering the internationalisation of the regional industry

- **Feasibility study and dimensioning** in order to evaluate specific requirements collected at regional level for the consolidation of the cluster.
- **Cooperation readiness and effectiveness assessment methodologies** an internal pro-active assessment that a company can put itself through, in order to make its capabilities available for companies looking for suitable collaboration partners.
- **Design and implementation of the collaborative framework in the aeronautical cluster**, covering:
 - Legal & Governance Framework: definition of mutual responsibilities models between the different actors, to allocate relevant liabilities and to manage the various aspects of the collaborative actions.

- Cooperation management: best practices, methodologies and ICT tools to foster the interoperability within the network.
- Strategy, Business Architecture and Finance: Analysis of collaborative business opportunities and construction of specific models for the Virtual Enterprise. The aim is to enable the internationalization through connection and interoperability with analogue aeronautic clusters around Europe
- **IT & Technical Architecture:** ICT infrastructure enhancement: integration of complementary e-services in the existing platform to provide more integrated Supply Organisation, Product/Services and Processes to the customer (OEM) by improving the efficiency and effectiveness of coordinating the supply network.
- **Pilot case conduction** aimed at implementing the collaborative approach in an industrial context within the cluster, in order to validate the approach, evaluate the effectiveness and benefits of the collaborative paradigm. Feedback and best practice definition for further development and extension to other sectors.
- **Extension of the results** at regional level, by adapting the reference models, ICT solutions and best practices to the identified strategic industrial sectors.

4 FINDINGS

The exploitation strategy aims at overcoming the current demand oligopoly of the main contractors in the region, by promoting the connection and interoperability with analogue European clusters by building a full cooperative paradigm and thus assuming workload in the international market. The majority of auxiliary subcontractors run specific manufacturing activities, but has no organisational, technical and economic structure to assume further phases in the production phase.

The subcontracting strategy is driving towards the horizontal integration of auxiliary SMEs in collaborative networks to carry out process/product innovation to be competitive. Acting in this way, the companies reduce costs duplicity, and take advance of scale economies, in order to gain the needed capacity to face new excellence requirements and the previously identified business goals.

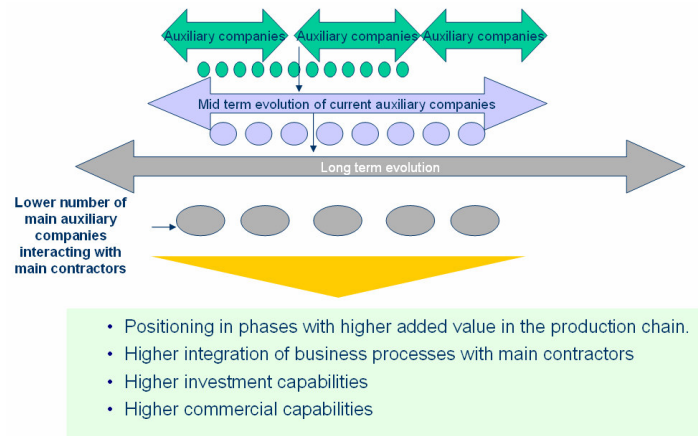


Figure 3. Horizontal SMEs integration

The evolution of existing associations towards a Virtual Enterprise, considered as a single business entity, compounded by companies that share capitals and competences, with dynamic and agile relationships is foreseen as a suitable form of linking companies to enhance the customer’s value proposition and timely exploit the European market, otherwise not possible for the individual companies in a profitable manner.

The existing collaboration model and ICT infrastructure, which is already in use, were developed to fulfil the need of the main contractor EADS-CASA, and thus support cooperative processes in the upstream supply chain. At regional level, the adoption of ICT tools, complementary to the existing ERP derived ones, will support the collaboration among the SMEs in the cluster.

On the other hand, the advanced international collaborative scenario that is a reality in the global aerospace industry demands an evolution of this “Extended Enterprise” business case, where the main contractor demands technology and process compliance of the supply chain. When a consortium of distributed international partners (OEMs, integrators, SMEs) work together to produce a product, it will span the multiple participating extended enterprises. It is unlikely that all the partners use the same tools, even if that is the case these tools will be configured differently. The collaborative framework will therefore have to use a flexible collaboration platform to support collaborative practices with disparate tools and technologies.

5 CONCLUSIONS

An advanced collaborative network, providing the preparedness, methodological and ICT framework to foster the horizontal integration of SMEs is considered an effective instrument to consolidate the local industry in the global aerospace market.

Ongoing initiatives are focused on enhancing the cluster infrastructure, with preparedness/measures/enhancement oriented methodological and ICT solutions to support the dynamic management of Virtual Organisations to carry out joint projects at national and European level. This environment should support flexible collaboration between heterogeneous partners and suppliers (and different clusters), over compatible IT infrastructure and processes. The goal of SMEs is to gain the needed capacity to complement their skills and assume joint workload in the international aeronautic market.

The adoption of this cooperative paradigm will have an enormous impact on the regional economy, not only for the aeronautical cluster stakeholders, but also for different strategic industrial sectors. The multiplying effect will promote the adoption of the resulting “Best Practices” to set up clusters of companies, leveraging complementary technologies and capacities of their associates, considering the aeronautic sector as a starting reference.

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