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AIRFID: RFID Solutions in the Aeronautic Sector

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Executive Summary

Introduction

Over the decades, the complexity of aeronautic programs and the fierce competition among major players have been such that overcost and delays have become inherent features of this industry. For this reason, the success of a company in this sector depends on two factors: costs and organisation. Given the current situation, AIRFID S.L. has decided to target this market to tackle both problems by taking advantage of the benefits of RFID technology.

Opportunity

Today, there are several factors that strenghten the attractiveness of entering this market:

- **Increasing cost-cutting trend in the aeronautic sector:** RFID technology optimizes space, personnel and asset utilisation thereby increasing productivity and efficiency.

- **Recent certification of the use of RFID in this industry:** Although it is still an emerging technology, it has already been standardized and deployed in many important industries. In the case of the aeronautic sector, its use on board has recently been certified, which opens the opportunity to enter not only the manufacturing process but also the maintenance of the whole life cycle of the aircrafts.

- **Exponential expansion of RFID:** The global business of RFID is growing exponentially and is set to threefold in the next 5 years [1]. Therefore, it is a very attractive moment to create a company specialized in RFID solutions, as the growth perspectives of the market will affect positively the performance of the company.

Business Model

AIRFID offers customized RFID solutions to fulfill the tracking needs of aeronautical companies, starting with the control of tools, jigs and test systems. In line with the nature of the sector, AIRFID is a "turnkey" solution with payments made against delivered milestones. A preliminary study of the potential market has been used to define 3 different modules that will be adapted according to the requirements of the different companies. These modules will offer the following services:

- **Improved asset control:** RFID is a powerful tool to significantly reduce search and inventory times. Once the assets to control are tagged and an asset inventory database is created, it will be possible to detect the missing items at a glance. For this purpose, workers will use handheld devices with wireless connection to the database. Additionally, location information will be available, which will inform the user about where the tool was last read and even about which its current situation is.

- **Efficient Book-In and Book-Out processes:** The process of booking in and booking out equipment from a warehouse will be made much simpler by using an RFID reader that will associate the asset and the worker, which will save time, enable a better calibration and prevent equipment losses or misuses.

- **Enhanced Jigs maintenance:** Up to now, jigs have been controlled by the use of metal nameplates that include a limited amount of information. With RFID, maintenance information for the whole life cycle of each product will be available in seconds.

- **Accurate export license products control:** The high tech equipment that is sold under an export license agreement will be easily controlled through the use of RFID. This will be especially useful in testing stations of final assembly lines, which need to know exactly where these devices are and where human errors can have serious implications.

Industry Overview

Airbus and Boeing, the world's aeronautical leaders, have already detected the benefits of using RFID and have worked on several projects in different production plants. As a matter of fact, Airbus has already distributed an RFID specification to its providers, which means that RFID technology in this industry will soon be widespread.

Target market

Historically, Spain has always followed in the steps of other developed countries. In 2009, the growth of RFID in the European countries rose an average of 39 %, while Spain only obtained a 3% [2]. However, the economical recovery of the forthcoming years will definitely consolidate RFID technology in Spain. Figure 1 shows that the Compound Annual Growth Rate (CAGR) of RFID sales in the next 8 years foresees a high potential market where to do business [3]. For this reason, it is important to be well positioned in this market to make profit from the future thrust of RFID in Spain.

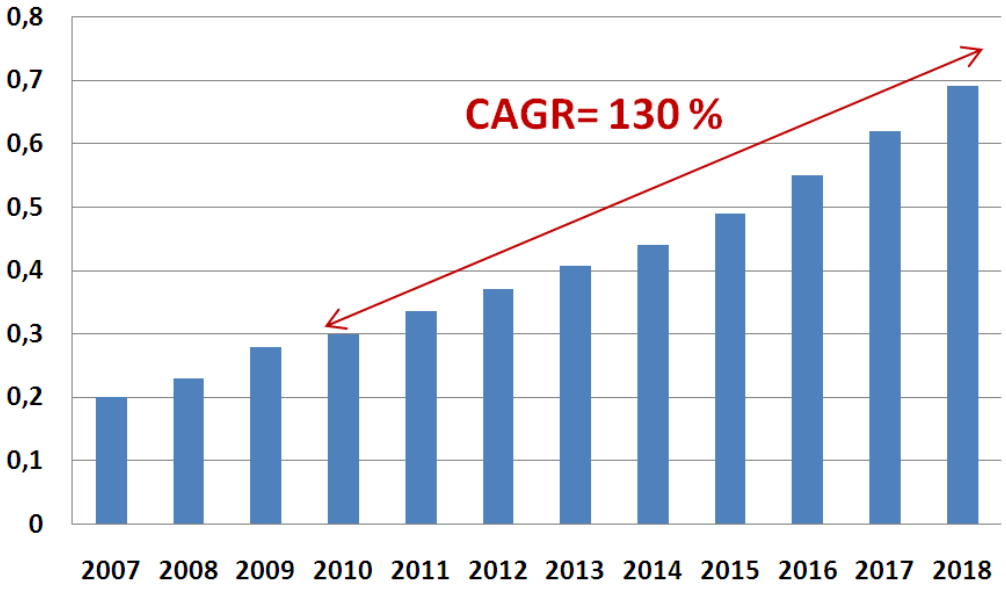

Figure 1: Evolution of the RFID revenues in Spain. In billions €

The aeronautic industry of Andalusia is the second most important of Spain in terms of revenues, and it presents attractive figures of growth and new project opportunities. This, together with the lack of competitors for RFID solutions for this sector in Andalusia, make this niche market an attractive opportunity for a company like AIRFID. Therefore, this region has been selected as the target market, although a geographical expansion to other regions is also considered.

With regard to the demand estimation of AIRFID S.L., it plans a progressive entrance in the Andalusian aeronautical sector, with 2 projects in the first year and 6 in the fifth year, with an average price per project of 190.000€. During this period, the most important companies are targetted with the strategy to expand along their supply chain once their RFID solutions are operative.

Competitive Advantage

Currently there are no competitors in the market of RFID in the Andalusian aeronautical sector, but it is possible that other more experienced RFID companies from other sectors may enter the market in the future. Therefore, it is key to be a "first mover" and reach the largest amount of companies. In order to do so, AIRFID will make use of the following strengths in order to achieve a significant competitive advantage:

- **Knowledge of the aeronautical sector:** The members of the company have worked in different areas in such an important company in the Andalusian aeronautic sector as Airbus Military. Some members will take advantage from working in the Quality and Subcontracting departments, which has enabled them to build a network of contacts in the different companies in the sector. Some others have worked in Systems, Procedures and Cost Accounting, which will be helpful to understand and foresee the needs of the clients.

- **High technical skills:** The five partners are engineers, 2 of whom are specialized in Telecommunications, 2 in Electronics and another in Materials. Moreover, their tasks in the company are perfectly adapted to their academic profile in order to make the most of the different software, hardware and new materials used.

- **Flexibility in the applications:** The company will offer different packages to their potential clients, so that they can combine them to fulfill their requirements. In case some customization is needed, the company is prepared to react quickly due to its flexible structure and its motivation to obtain new clients.

- **Competitive prices:** AIRFID will offer competitive prices compared to the average RFID consulting companies, as its low fixed costs structure is prepared for relatively small margins as a way to enter the market. For this reason, its hourly rate is 35% lower than the average of the technical consulting companies. Once the first turnkey projects are delivered to several important aeronautical companies in the sector, other enterprises along the supply chain will request RFID services. At this point, margins will increase due to an improvement of the market perception of the quality, experience and performance of AIRFID.

Financial Highlights

The activity is planned to start in July 2010. AIRFID expects to attain attractive profits once the first RFID solutions are implemented in the Andalusian aeronautical market. The table below highlights the expected results from the first 5 years of operation.

	Year 1	Year 2	Year 3	Year 4	Year 5
Sales	376,511 €	634,328 €	861,036 €	1,088,585 €	1,300,289 €
Op. Exp	429,427 €	626,094 €	778,576 €	957,973 €	1,157,848 €
EBITDA	- 52,916 €	8,234 €	82,460 €	130,612 €	142,441 €
Margin	-	1%	10%	12%	11%
Net Profit	- 43,437 €	2,820 €	59,379 €	90,058 €	99,249 €
ROS	-	0%	7%	8%	8%

Contents

Chapter 1

Introduction

This chapter describes the main motivations and purposes of AIRFID S.L. This company is born with the aim of providing competitive solutions that help the aeronautical sector facing current difficulties, as its explained in the following section. After this, the Mission and Vision of the company are presented, followed by a short description of the business model.

1.1 Current challenges of the aeronautic industry

The aeronautic industry has several characteristics that make it one of the most difficult sectors to be in: design and development phases of years, huge investments needed, high amount of subcontractors to handle, fierce rivalry among major players, high exposure to euro/dollar exchange rate and very elastic demand. Up to the year 2000, the companies used to have all the design, development and manufacturing process under control, which meant that they were able to deliver their orders on time. This guaranteed that the margins were not altered by overcosts caused by penalties for late deliveries or by unplanned periods of development phase.

Since the year 2000, the situation has changed significantly. Outsourcing has gained importance and much more complex projects have been made in order to fulfil the customers' requirements in terms of efficiency, range, payload and delivery times. With this goal, the aeronautic industry has done major changes in their traditional designs and manufacturing processes while they were shortening more and more the development phase in order to achieve the initial orders needed to launch the program.

Unfortunately, many design problems have aroused both in-house and in the subcontractors' facilities, which had lead to huge overcosts and big delays in the initial deliveries of all the last programs of Airbus and Boeing, the biggest aeronautic companies in the world. As a matter of fact, Airbus

has suffered a 3 years delay in the first flight of the military aircraft A400M, which meant an overcost of around 11,000 million €, and a 2 years delay in the A380, the largest mass-produced aircraft in the world. This has caused that EADS lost 763 million € in 2009 as a result of 1,800 million € for provisions for the A400M and 240 million € for the A380. With regard to Boeing, they have recently managed to fly their B787 Dreamliner after 2 years of delay and many design problems, which have also made the company spend a huge amount of money and resources [4].

Given this current scenario, Boeing and Airbus have launched several programs aimed to cut costs, as Power 8 and Horizon 2011 in the case of Airbus and the PIP (Productivity Improvement Program) in the case of Boeing. These programs are based on a better use of the resources and on a decrease of the non-productive times.

One of the most attractive initiatives is RFID technology, which offers a revolutionary approach to keep control of all the productive process and maintenance of an aircraft. It offers a 90% decrease in time spent doing inventory and book-in and book-out operations [5] and has an extraordinary value to avoid asset losses and to keep track of all the maintenance operations of test systems, jigs and aircraft parts during their whole life cycle. As a matter of fact, the benefits from using RFID are such that the Return on Investment period is of only one year, according to Airbus chief officer for RFID [6]. Furthermore, Airbus and Boeing have already given their RFID specifications to their major providers and subcontractors.

AIRFID S.L is born with the clear objective of taking part in the future expansion of RFID in the aeronautical sector, as in the following months RFID applications will be needed by companies along the whole supply chain. There are no companies in the field of RFID in the Andalusian aeronautical sector, which is a very attractive opportunity for the growth of a new technological company as AIRFID in this region.

1.2 Mission

"To extend the benefits of RFID technology in the Andalusian Aeronautical Sector"

1.3 Vision

"To become the leaders in RFID solutions in the Spanish Aeronautical Sector"

1.4 Business Model

AIRFID offers customized RFID solutions to fulfill the tracking needs of aeronautical companies, starting with the control of tools, jigs and test systems. In line with the nature of the sector, AIRFID is a "turnkey" solution with payments made against delivered milestones. A preliminary study of the potential market has been used to define 3 different modules that will be adapted according to the requirements of the different companies. These modules will offer the following services:

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- **Accurate export license products control:** The high tech equipment that is sold under an export license agreement will be easily controlled through the use of RFID. This will be especially useful in testing stations of final assembly lines, which need to know exactly where these devices are and where human errors can have serious implications.

Chapter 2

RFID Overview and Evolution

2.1 Introduction

In this chapter we are going to give a brief overview about what RFID means and how it has evolutioned since its beginnings besides what is its current status in Spain.

RFID or Radio-Frequency Identification is a technology that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency (RF) portion of the electromagnetic spectrum to uniquely identify an asset [7].

A RFID system consists of three components: an antenna and transceiver (often combined into one reader) and a transponder or tag, where the antenna uses radio frequency waves to transmit a signal that activates the transponder. And once it is activated, the tag transmits data back to the antenna (see Figure 2.1 in the page 24). This data can be used to notify a programmable logic controller that an action should occur. This action could be as simple as raising an access gate or as complicated as interfacing with a database.

Regarding the transmission ranges there are three frecuencies, low, medium and high-frequency RFID systems. In general, the higher the frequency, the more expensive the system is.

The EPCGlobal standard from EPCGlobal defines four classes of tags as class 1, 2, 3 and 4, where each successive class has higher functionality than the previous one and is also backward compatible.

RFID technology is becoming an alternative to the barcode in the industry since one of the most important advantages is that it does not require direct contact or line-of-sight scanning, a real cost and time consuming task.

In Chapter 5 a more detailed technical description about RFID functioning will be presented.

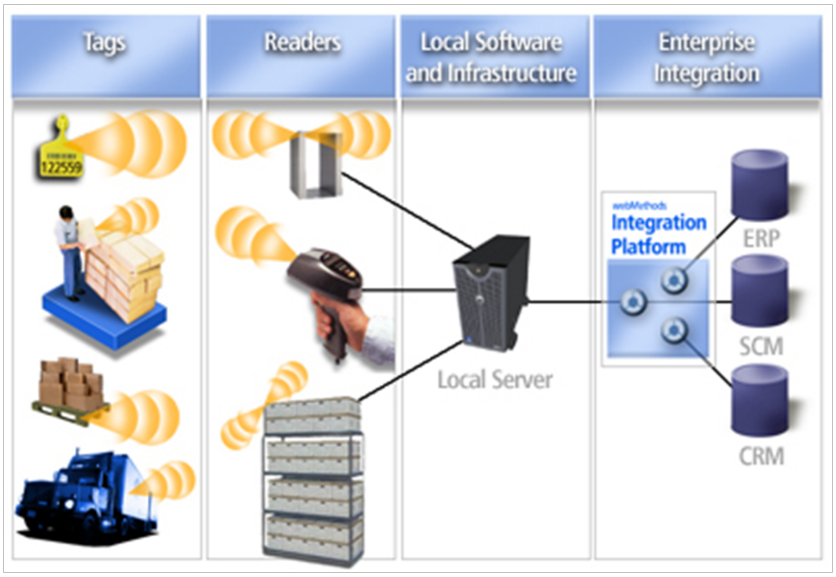

Figure 2.1: RFID Technology Elements

2.2 RFID Evolution

In this Section the main milestones and facts in the RFID evolution will be explained.

Radio Frequency Identification is a technology whose evolution has been disproportionate in the recent years in spite of not being a very well-known technology.

Some of the main milestones in RFID evolution are listed below:

- First bar code patents (1930s).
- World War II: First use of RFID device (1940s).
- Harry Stockman´s paper: Communication by means of reflected power (1948).
- First RFID Patent (1973).
- Auto-ID center founded at MIT: Standardization by EPC Global (Electronic Product Code) (1999).
- Current thrust primarily driven by Wal-Mart in USA (2003).
- Knowledge and implantation in production and logistic processes.

Although in Chapter 3 the general applications for RFID will be analysed, a checklist of several benefits that can be achieved by using RFID technology is listed below:

- Increases information availability and location.
- Optimizes space, personnel and asset utilization.
- Eliminates human error.
- Minimizes risk.
- Increases productivity and efficiency.
- Reduces costs.
- Reduces inventory and out-of stock conditions.

Although the use of this technology offers many benefits the implementation costs are relatively high. Nevertheless, this implementation is justified because it provides a good return on investment in a very short period.

Due to this fact the investment on RFID technology is increasing sharply, since the return periods has been reduced in a substantial way. These facts show us the relevance that RFID is having now and will have in the future. As an example the number of companies from different sectors that are seeking the benefits of RFID is increasing by 60% year by year [8].

Nowadays, as it can bee seen in Chapter 9, there is a gap in the Spanish aeronautical sector market since no RFID company is operating in this sector.

2.3 Current status of RFID in Spain

Nowadays most of the Spanish companies have not recognized the competitiveness improvement of implementing RFID technology in their business processes.

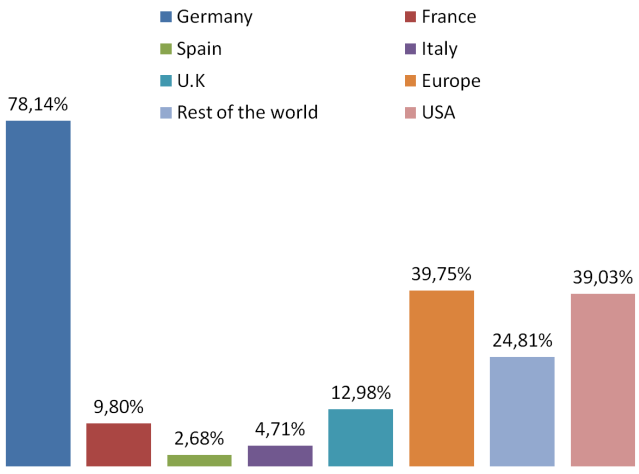

Figure 2.2: RFID growth rate in the world.

An example of that can be appreciated in Figure 2.2. While RFID growth rate in Spain does not exceed 2,68%, the average in Europe is situated at 36,88% [2]. Although RFID growth rate in Spain is at an early stage, the expected growth rate is considered to be unstoppable in coming years.

Finally, taking into account on the one hand that a RFID market research made by ABI's experts shows that the RFID market will reach $5.35 Billions in 2010 and $8.25 Billion in 2014, and on the other hand another forecast of the expected evolution of the number of RFID tags in use (see Figure 2.3)[9], we have figured out that a fast change in the way of tracking assets is about to happen, so AIRFID must make a good profit from it.

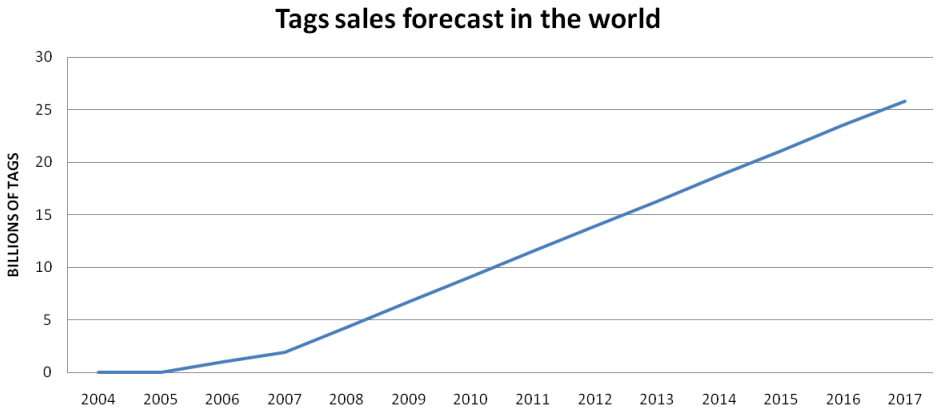

Figure 2.3: Forecast of the number of RFID tags in use (in Millions)

To sum up, given that the current RFID market in Spain is very small, in order to be well positioned in the market AIRFID must start working as soon as possible with the aim of satisfying our possible customer's needs before our competitors do.

Chapter 3

General applications for RFID

The applications of RFID technology are endless. A list of some applications and a figure with the main sectors where RFID is being currently used are shown below:

- Inventory control
- Fleet maintenance
- Equipment/Personnel tracking
- Container/Pallet tracking
- Parking lot access and control
- Assets tracking through manufacturing and assembly
- ID badges and access control
- Hospital/Healthcare applications
- Pharmaceutical applications
- Security
- Supply Chain (e.g. WalMart/Dod)

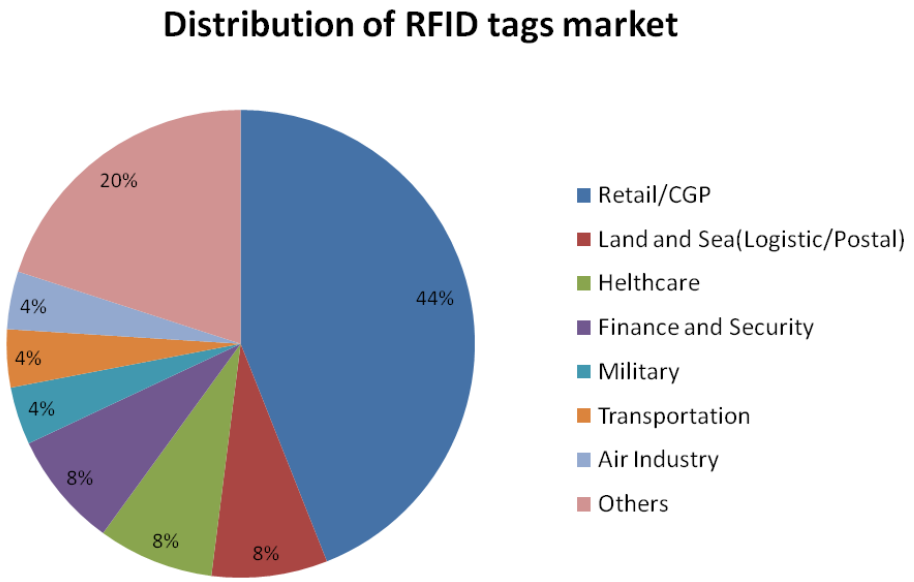

Figure 3.1: Distribution of RFID applications by sectors [10]

However it must be taken into account that an increase in the use of RFID technology is expected as the cost of the equipment (tags, readers, printers, etc.) decreases [11]. Thus, RFID will convert into a more profitable technology and as a consequence the opportunities to implement it will grow exponentially.

General benefits of using RFID

As far as the benefits of implementing this technology is concerned we can summarize its benefits as follows:

From the business point of view RFID allows to:

- Enhance merchandise or asset management.
- Reduce operating expenses.
- Increase revenues and/or margins.

Regarding the technology itself RFID has many advatanges, as for instance:

- Upgradables reader platforms software.
- Able to manage large volumes of data.
- Applications that can be scaled as the deployment expands.
- Compatibility with large global partners´s systems.

Figure 3.2 summarizes some of the applications that are being adopted in Supply Chain, as well as the benefits that can be derived from its implementation.

In the next sections some applications of RFID technology as well as the benefits that it can offer are explained in detail, in order to have a general perspective of the scope of this technology.

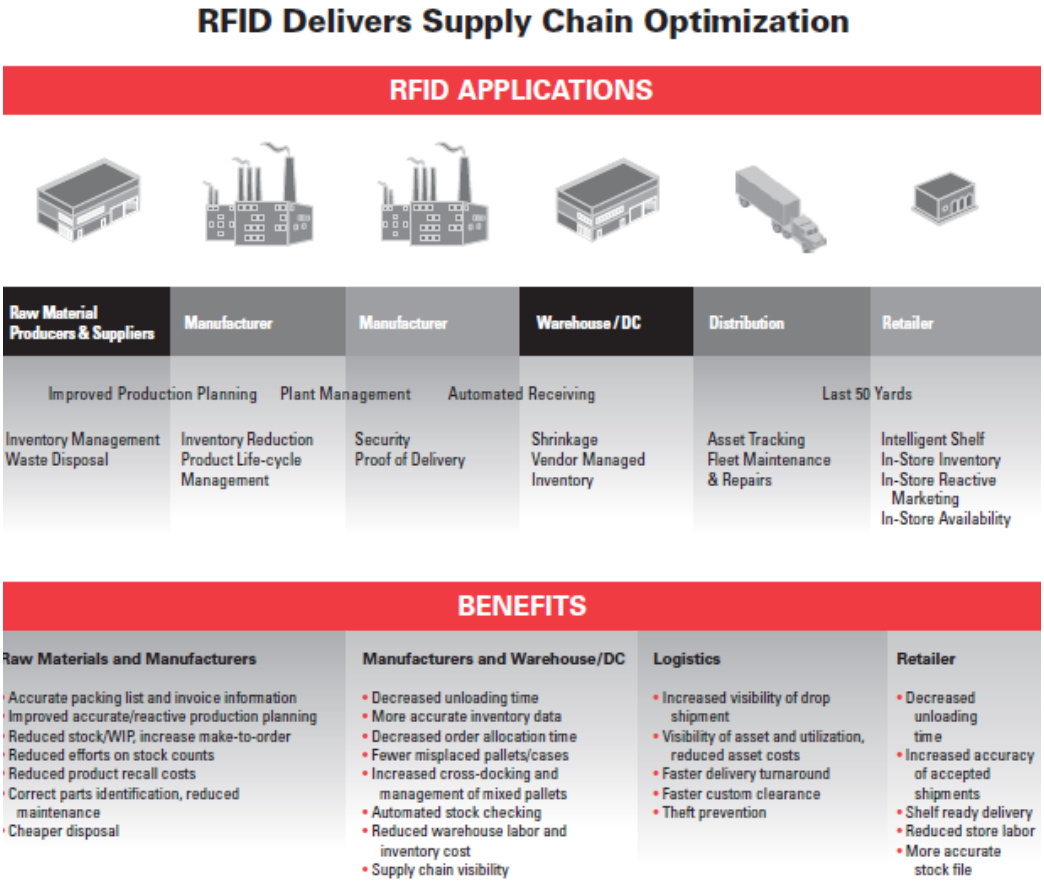

Figure 3.2: Applications and benefits of using RFID throughout the Supply Chain [12].

3.1 Inventory Control

Although many companies are now using sophisticated Warehouse Management Systems integrated with Supply Chain Systems, Enterprise Systems, and Electronic Data Interchange (EDI), the movement and tracking of goods through the manufacturing and supply chain process is still a complex procedure which is difficult to manage. In many instances, the goods being distributed to the retailer must go through one or more third party distribution processes, before they reach their final destination[13].

Currently, most material tracking systems employ two-dimensional barcodes that must be close to and within the "line of sight" of the barcode reader. This requires manual scanning or a conveyor-like process to position the barcode and scanner. Furthermore barcodes can run the risk of getting wet or scratched due to mishandling or a harsh environment, which often prevents accurate reading by the scanner as well as that manual intervention is labor intensive, costly, and error-prone.

In addition, scheduled scanning or manual methods cannot ensure the inventory remains up-to-date, due to oversights, errors, and internal shrinkage. With RFID solution, inventory can be updated in real time without product movement, scanning or human involvement, knowing automatically for instance those products that are low in inventory.

Among many benefits for inventory control a RFID system:

- Provides total asset visibility.
- Gives full inventory history.
- Allows reduced inventory-stocking levels.
- Facilitates "Just-in-Time" deliveries.
- Provides full process control for products in the facility.
- Reduces lead-time.
- Shortens cross docking time.
- Speeds up sort/pick rate.
- Reduces shelf space.
- Provides higher-level security.
- Reduces errors.
- Reduces overall cost of operations.

3.2 Security

Security and personal identification applications are a major and broad application of RFID.

A common use of RFID is in identification cards to control building access where a RFID tag is embedded in the ID card which is readable at the building entrance. It is also widely used as a payment device (e.g. American Express´ ExpressPay, ExxonMobil´s Speedpass, etc.), for example in mass-transit systems (SmarTrip card for the Washington DC area subway and bus system). Essentially, RFID is a replacement for identification cards with magnetic stripes, providing a higher capacity and a more reliable way to store identification information -magnetic stripes tend to wear out and lose information over time.

Finally, as an example many new cars also incorporate passive RFID tags that work with a reader near the cars ignition switch so the reader will only accept codes stored in certain keys, making it more difficult to steal vehicles by copying keys [12].

3.3 Container / Pallet Tracking

RFID active tags can be programmed with contents and assigned locations and then placed on containers and pallets that are stored in a warehouse. Additional information can be collected and added to the RFID tags as the pallets move through the warehouse. The RFID tracking system can identify unscheduled movement, so managers and security can be alerted to possible theft.

RFID-based automatic tracking system can identify and keep track of goods that are located anywhere in the warehouse or in any other part of the building where an reader is installed. The amount of idle inventory tied up in storage can be greatly reduced through effective use of the information provided by the system.

RFID systems can also reduce theft and other forms of inventory shrinkage by immediately alerting the operations manager when a product is moved from its assigned area.

RFID solutions can also reduce the time and cost for counting stock as it enters the warehouse by collecting the data automatically and virtually eliminating the need for manual intervention.

Some benefits of using RFID Systems for container and pallet tracking are:

- Track the location of pallets and containers within the warehouse.
- Notify management and security when unscheduled movements occur.
- Reduce costs and time for check-in and check-out as containers and pallets enter and leave the warehouse.

3.4 Fleet Maintenance

With RFID technology, commercial, government, and private fleets can provide hands-free access to their maintenance depot. RFID technology also allows them to efficiently collect, track, and report operations and maintenance data for all of their vehicles that are in the depot. Hands-free technology can enable gate access, authorize fueling, and automate weighing operations, while allowing all associated record-keeping to be automated.

RFID Systems offer the next benefits for fleet maintenace:

- Provides faster and more accurate vehicle check-in, re-fueling, weighing, maintenance, and check-out.

- Tracks the location of cabs, trailers, and other fleet vehicles within the RFID-enabled parking lots, maintenance depot, and storage facilities.
- Allows vehicle maintenance to be automatically recorded and tracked.
- Allows a full history of fleet inventory to be maintained.
- Reduces maintenance and record-keeping errors by positively identifying each vehicle entity as operations are being performed.

3.5 Equipment/Personnel Tracking in Hospitals

A RFID system can be used to track patients, doctors and expensive equipment in hospitals in real time by attaching the RFID tags to the ID bracelets of all patients, so their location can be tracked continuously.

RFID technology can also provide an electronic link for wirelessly communicating patient data. An instant assessment of critical equipment and personnel locations is also possible through RFID technology. These applications can be combined with RFID access control to allow only authorized personnel to access to critical areas of the hospital.

Some benefits of using RFID Systems for Healthcare applications are the following:

- Continuously track each patient´s location.
- Track the location of doctors and nurses in the hospital.
- Track the location of expensive and critical instruments and equipment.
- Restrict access to drugs, pediatrics, and other high-threat areas to authorized staff.
- Monitor and track unauthorized persons who are loitering around high-threat areas.
- Facilitate triage processes by restricting access to authorized staff and "approved" patients during medical emergencies, epidemics, terrorist threats, and other times when demands could threaten the hospital's ability to effectively deliver services.
- Use the patient´s RFID tag to access patient information for review and update through a hand-held computer.

3.6 Parking Lot Access and Control

RFID technology can provide non-stop systems for security, parking, and access control, that is, a hands-free system to ensure only authorized vehicles. RFID can also provide access data for administering periodic access charges or parking fees.

The main benefits of using RFID Systems for parking access and control are the following:

- RFID tags can be affixed to automobiles for activating hands-free access to communities and parking lots. The RFID reader can also trigger surveillance cameras or video recorders whenever a vehicle enters or exits the controlled area.
- Each access can be recorded in the RFID reader or host computer's database to maintain a history of access activities and administer billing of daily, weekly, or monthly fees.

3.7 Product Tracking through Manufacturing and Assembly

Manufacturers can track and record in-process assembly information into the RFID tag as an item progresses along the line.

RFID solutions are ideal for manufacturers who build several products on a single production line, or manufacture complex or customized products. Assembly line personnel could use an RFID reader to verify which processes have been completed, to determine which inspections or tests are required and to automatically update the central production database.

Production planners and inventory control personnel could use RFID tags to automatically update the customer database and finished goods inventory, using an RFID reader and PC, rather than manually creating data entry sheets, which could introduce errors into the system.

Four benefits of using RFID Systems for product tracking are:

- Maintains current item information on the tag, eliminating the need for separate paperwork on assembly status and content.
- Can automatically notify the central product database when each process has been completed.
- Field personnel could use RFID tag to determine product features, date of manufacture, revision levels, etc.
- Real-time tracking of inventory, part kits and sub-assemblies.

3.8 Supply Chain (WalMart/DoD)

With the Wal-Mart and Department of Defense of the United States, suppliers are required to begin tagging a subset of the cases and pallets that are being shipped to selected distribution centers.

As it can be seen in Figure 3.3 and the list that is shown below the use of RFID systems creates a number of benefits for the suppliers:

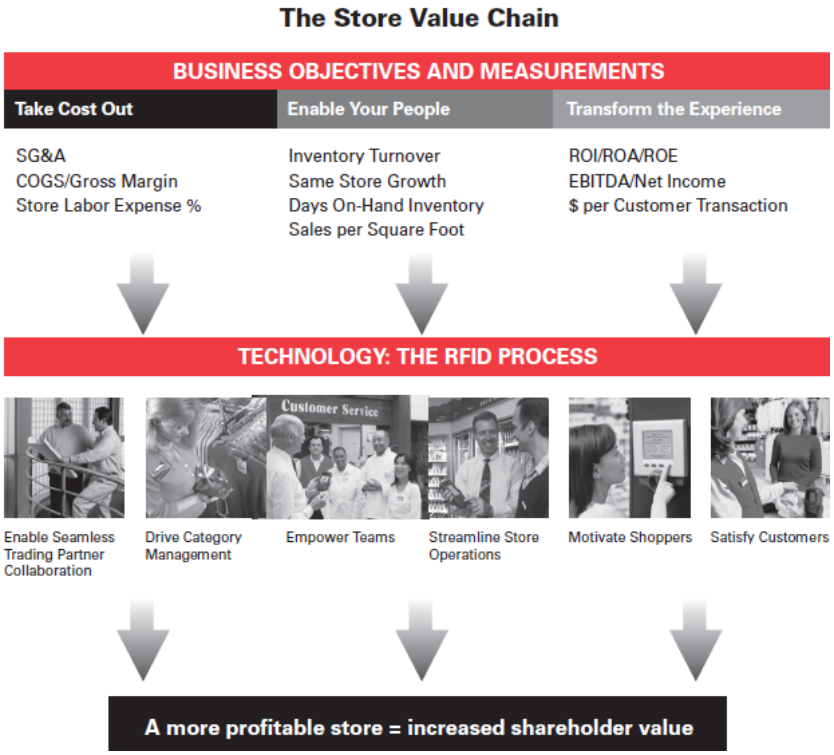

Figure 3.3: Number of RFID tags in use [10].

- Determining the RFID friendliness of their products.
- Identifying the best location for the tag.
- Deciding how the RFID system should interface with their existing host systems.
- Determining where in their flow the tagging process should occur.
- Deciding whether RFID will be used solely for outbound compliance or if it will become a part of their overall operation.
- Selecting the best technology and partner(s) based on their requirements.

WalMart Business Case

In the appendix Wal-Mart's Race for RFID, we can see all the benefits that RFID has for the world's largest public corporation by revenue and how it was developed.

Chapter 4

RFID in the aeronautic sector

4.1 RFID technology in the aeronautic sector

In the aeronautical sector, a wide range of companies are found, with activities as different as manufacturing commercial aircrafts, or providing catering services for airliners. Table 4.1 shows a list of existing activities related to the aeronautic market.

Most of the categories shown in Table 4.1 could be susceptible of the implementation of a RFID project, as they work with inventories of parts (i.e. aircraft parts-general, electronics, MRO) or provide services where an improvement in identification could suppose an advantage (air cargo, airport products/services). Some other categories seem to be, at a first moment, not interesting to our business plan (auctions, financing-leasing).

In a first moment, our business plan borns to cover a necessity detected in the military aircraft manufacturer category. Just to have a global vision, Table 4.2 shows a list of the most important aircraft manufacturers all over the world.

As it will be explained in the Marketing Plan Section, we will select some target customers for the company to grow up. In addition we have to consider that although the necessity has been detected in the military aircraft manufacturer sector, the products/services presented will be applicable to civil aircrafts manufacturers as well as Tier 1, and many Tier 2 and 3 suppliers. So, the possibilities are really high, and the penetration of RFID technology is still very low.

Today, just a few RFID projects are being carried by the aerospace companies (at least, projects that have been released to the public). The next points will explain these projects. As we will see, the most important aircraft manufacturers in the world (Boeing and Airbus) are carrying pioneer RFID projects since recent years, mostly focused on the improvement in the supply chain. These two companies are leading the movement to this technology,

Companies	
Advertising&Design	Financing-Leasing
Aerospace	Fire Suppression
Agricultural Aviation	Flight Simulators
Air Cargo	Flight Support
Aircraft Aerospace Coatings	Fluids-Lubricants
Aircraft Covers	Fuel-Systems-Suppliers
Aircraft Dismantling	Ground Support Equipment
Aircraft Interiors-Commercial	Hangars
Aircraft Interiors-Corporate	Helicopters
Aircraft Interiors-General	In-Flight Services
Aircraft OEM	Insurance
Aircraft Parts-Commercial	Inventory Control Management
Aircraft Parts-Corporate	Manufacturing
Aircraft Parts-General	Marketing Products-Services
Aircraft Parts-Helicopter	Metals-Raw Materials
Aircraft Parts-Military	MRO - Maintenance-Repair-Overhaul
Aircraft Parts-Sources	Navigation Equipment
Aircraft Sales - General	Overhaul Parts-Commercial
Aircraft Sales Corporate	Overhaul Parts-Corporate
Aircraft Sales-Commercial	Overhaul Parts-General
Airlines	Overhaul Parts-Helicopter
Airport Products-Services	Overhaul Parts-Military
AOG Services	Painting-Markings-Detailing
Associations	Pilot Services-Supplies
Auctions	Professional Services
Aviation Security	Publications
Avionics-Instruments-Commercial	Real Estate
Avionics-Instruments-General	Safety-Compliance
Avionics-Instruments-Helicopter	Shipping-Freight-Courier-Cargo
Avionics-Instruments-Military	Sport - Experimental Aviation
Charter Services	Staffing-Recruiting-Employment
Chemicals-Cleaning-Solvents	Tapes-Sealants-Insulation
Composites-Moldings-Sealants	Technology-Software-IT Services
Consultants	Testing-Inspection
Education	Tools-Tooling
Electronics	Trade Shows-Conferences-Events
Engines	Travel Services
FBO - Fixed Based Operators	

Table 4.1: Activities related to the aeronautic market

Company name	Website	Country
Aermacchi	www.aermacchi.it	Italy
Aero Vodochody	www.aero.cz	Czech Rep.
Aerostar	www.aerostar.ro	Romania
Airbus Military	www.airbusmilitary.com	Spain
Alenia Aerospazio	-	Italy
Antonow	www.antonov.com	Ukraine
Avioane	-	Romania
BAE Systems	www.baesystems.com	UK
Boeing	www.boeing.com	USA
Chengdu	-	China
Dassault Aviation	www.dassault-aviation.fr	France
Embraer	www.embraer.com	Brasil
ENAER	www.enaer.com	Chile
EADS	www.eads.com	Europe
Fuji Heavy Industries	-	Japan
Guizhou Aviation	-	China
Hawker Beechcraft	www.hawkerbeechcraft.com	USA
Hindustan (HAL)	www.hal-india.com	India
Hongdu Aviation	www.hongdu.com.cn	China
Iljuschin	www.ilyushin.org	Russia
Jakowlew	www.yak.ru	Russia
Kawasaki Heavy Ind.	www.khi.co.jp	Japan
Korea Aerospace Ind.	www.koreaaero.com	South Korea
Lockheed Martin	www.lockheedmartin.com	USA
MIG	-	Russia
Mitsubishi Heavy Ind.	www.mhi.co.jp	Japan
Northrop Grumman	www.northropgrumman.com	USA
Pilatus Flugzeugwerke	www.pilatus-aircraft.com	Switzerland
Saab	www.saab.se	Sweden
Shaanxi Aircraft	www.shanfei.com	China
Shenyang Aircraft	www.sac.com.cn	China
Shinmaywa	www.shinmaywa.co.jp	Japan
Suchoi	www.suchoi.org	Russia
Xian Aircraft	www.xac.com.cn	China

Table 4.2: World aircraft manufacturers

and as a consequence, it´s expected that other competitors follow their steps in order to catch up with that competitive edge.

Also providers and suppliers are expected to appreciate the benefits of this technology as soon as it´s consolidated in these two companies. So the expectations and the potential market for RFID technology are huge, and still unexploited.

4.2 RFID projects in Airbus

Airbus, the second largest aircraft manufacturer in the world, is today immersed in an ambitious and huge RFID project [14] that has as target to improve the business processes.

As a huge project, Airbus has divided it in three stages:

1. The first release targets "quick wins", or applications that are the least complex and can be realized with off-the-shelf technology. Examples include supply chain tracking, warehouse logistics, and closed-loop asset tracking. For example, jigs employed to charge and discharge parts in the Beluga has been tagged in order to know where they were read for the last time and avoid delays in the delivery of parts because of jigs not available at the right place in the right time.

2. The second release targets the more involved industrial processes such as internal transport, manufacturing tracking, production tool handling, and ground test tool handling. An example of this stage is in Filton (UK) facilities [6]. The aircraft manufacturer wanted to reduce the time it takes workers to "book in" and "book out" the tools they need. At present, employees go to the tool room, stand in a line and request the items they need for a given day's work. A staff member behind the service window retrieves the necessary tools and writes down what is being checked out. When items are returned, a tool-room employee then records what is being checked back in.

   Once the RFID implementation is finished, employees running the tool room will pass RFID-tagged items across a table under which a reader is mounted. The system will identify the tool through the unique number on its tag, and associate that information to the worker, via his RFID badge (employees already have such badges). The interrogator under the table will comply with the EPC Gen 2 standard and ETSI regulations. Airbus expects to tag several thousand handheld tools in order to reduce the time required to check them in and out.

   This project can also help to create patterns for tools use, and thus optimize calibration and maintenance processes. At present, Airbus calibrates tools based on pre-set fixed times. However, if it can reliably and accurately determine how often a tool has been used, the company

can extend the calibration period and potentially cut down on unnecessary work. The manufacturer determined that the tool-tracking application will pay for itself within 12 months, and has chosen to roll out the system in Filton by the end of 2009.

Releases 1 and 2 fall under the "non-flyable visibility" umbrella where they don't target applications that involve active, flying aircraft.

3. The third and final release is "flyable visibility", which targets MRO (maintenance, repair and overhaul) and cargo tracking. Airbus has distributed RFID and CMB (contact memory button) requirements as part of its technical specifications for suppliers worldwide for the A350 extra-wide body (XWB) aircraft currently under development. The requirements distributed by the company will not impact all Airbus´ suppliers, but will affect all those that provide parts involved in a repair cycle. Exact parts or systems impacted by the requirements are not known yet, since the aircraft systems are still in the detailed definition phase, but it´s expected that approximately from 2,000 to 5,000 parts could require RFID part marking by suppliers by 2011 or earlier. The A350 XWB is scheduled to enter into service in 2013.

   For example, if a part is serialized, repairable and replaceable, it would require either an RFID tag or a CMB. In pressurized areas of the aircraft, RFID tags will be employed. In unpressurized sections, however, it is likely that contact memory buttons will be used, because of their greater robustness to harsh environments compared with current ultrahigh-frequency (UHF) tags.

Another pilot project carried out by Airbus is for example the improvement of the attesting process. That is, an aircraft must compulsorily mount specific parts (seats, life jackets) that must be checked before delivering the aircraft to the customer. That part checking is known as attesting. This is typically a slow process that is now faster thanks to RFID. The parts to check are tagged before being mounted, and by the end of the assembly process, a reader permits to know whether all required parts are installed or not, in much shorter time than before. After that tags are removed (today) from the parts.

4.3 RFID projects in Boeing

Since 2004, Boeing has been using RFID to track parts shipped to its receiving facilities in Philadelphia and St. Louis. Suppliers apply passive EPC (Electronic Product Code) tags to cases and pallets of some parts and send advance shipment notices (ASNs) that include the EPC encoded to the tags. When Boeing receives the shipments,they read the tags and compare the EPCs to those listed on the ASNs, saving labor and increasing the accuracy of their parts-receiving process.

In 2004, when Boeing announced its upcoming line of 787 passenger planes -dubbed the Dreamliner- Boeing managers realized that the company could take its parts tracking to another level: using RFID to track a part's maintenance history throughout its life cycle [15]. Federal aviation regulations require that each part's history is tracked individually. Today, aircraft manufacturers, parts suppliers and carriers do this through a standardized bar-code system. Boeing believed that migrating to an RFID-based system would make identifying the parts more accurate and accessing their maintenance records simpler.

In October 2003, Boeing conducted a 90-day in-service evaluation of HF passive tags attached to 40 parts on a Boeing MD-10 cargo carrier owned and operated by FedEx, one of its airline customers and a partner in the project. In 2004, Boeing and FedEx repeated the test, this time using UHF passive tags, because they offer a longer read range and were then headed toward an international standard, which since then has been adopted by EPCglobal and the International Standards Organization [16].

The tests of both passive tags showed that RFID did not interfere with equipment on the airplane necessary for continued safe flight and landing. Based on this, the FAA issued a policy in May 2005 stating that passive RFID tags could be attached to aircraft parts, as well as to cargo containers and baggage tags. The tests also showed that the tags could withstand the rigors -heat, cold, dirt, shock and vibration- to which aircraft parts are exposed during flight. The data encoded to the tags was still readable at the end of each test. These results were the proof of concept to Boeing.

With the green light to proceed, Boeing announced its Dreamliner RFID-tagging initiative in October 2005 [17]. Boeing identified 700 part types -all told, 2.000 parts- that would be useful in the 787, and said it wanted all of these parts tagged by the manufacturers before they were shipped to Boeing. The manufacturers are being required to use passive UHF Gen 2 tags with 64 kilobits of memory, which will allow airlines to encode each part's maintenance information directly to the tag.

Manufacturers will permanently attach the tag to a part and encode an identifying part number, a serial number (because the part number changes as modifications are made to the part during its life cycle), and a manufacturer code to the tag. This data will also be encoded to a bar code and printed onto a nameplate that is attached to the part, which is how parts are currently identified. (This data is linked to an updatable database that aviation industry supply-chain partners can access).

Boeing representatives say that being able to identify the 2.000 tagged parts will make it easier for them to compile a master list of the significant parts on each Dreamliner plane they manufacture. "It takes an army of people to go into the plane and collect the data" says Boeing. For most parts, they use handheld bar-code scanners. But in cramped places, such as the wheel well or avionics bay under the cockpit, it's impossible to position

the scanners in front of the bar codes for a line-of-sight read. Mirrors are often used to see the parts numbers, which are keyed into a handheld computer. An average of one in every 30 keystrokes is wrong, so manually entering part identifiers introduces a slew of inaccuracies. Capturing parts numbers via RFID has the potential to increase data accuracy significantly.

Also significant is the time airline mechanics will save accessing a part's maintenance history and locating spare parts. Mechanics will be able to use a handheld computer to read the tag on a part that is brought in for service, which will give immediate access to its repair history, instead of looking up the information in a maintenance log or an Internet-based parts database. This will be possible only because Boeing is working with Intelleflex to develop an aviation-grade high-memory tag.

Boeing plans to install RFID interrogators in its parts warehouses. Today, airline mechanics spend more than half of their time searching for specific parts. Boeing estimates that using RFID to track parts and hold their maintenance files could significantly reduce the cycle time to solve in-service problems.

Eventually, essential gear such as life preservers and emergency equipment -which airline crew are legally required to count before each flight- will also be tagged. Instead of walking down the airplane aisle and eyeballing each equipment item and lifting each seat, they could use a handheld interrogator. Boeing predicts that RFID could reduce the time crews spend on this task between flights from a half-hour to five to seven minutes, which could help keep flights on schedule.

RFID also promises to deter the introduction of unapproved parts into the aviation supply chain, because RFID-tagged parts could be easily verified and authenticated. This should benefit Boeing's suppliers, which lose considerable income through the black and gray markets for airline parts. And suppliers could benefit from more accurate record keeping, because it could reduce the costs associated with warranty claim processing.

4.4 RFID in airliners and airports

Radio Frequency Identification (RFID) is an extremely powerful enabling technology in airports and aircraft, serving to improve security against criminal attack, safety against general hazards, efficiency, error prevention and data capture and to remove tedious tasks [18]. It can even create new earning streams where it makes tolling feasible without causing congestion and where new airport "touch and go" cards offer new paid services without delays. RFID creates competitive advantage in many ways and in many locations. Managers in the air industry and their suppliers are in danger of being left behind if they are ignorant of the successes and new possibilities of using RFID to improve the air industry. The most common applications

	1. Supply Chain	2. Logistics & Distribution	3. Manufacturing/ Assembly Lines	4. Maintenance & Repair
Items to Track:	• Component Parts • Supplier • Batch Number • Due Date	• Carrier • Order Number • Order Contents • Final Destination • Due Date	• Work-in-Process • Tools and Equipment • Test Results • Custom Order Details	• Service History • Replacement Parts • Part Expiration Date • Service Due Date
Processes to Enable:	Sourcing	Receiving Reverse Logistics	Assembly Asset Tracking	MRO
Quantifying Value:	Increased Forecast Accuracy Reduced Safety Stock	Streamlined Shipping Costs Increased Order Accuracy & Customer Satisfaction	Improved Product Quality, Fewer Returns Reduced Downtime Reduced Scrap & Rework	Increased Time in Service Fewer Audits & Regulatory Fines Reduced Maintenance and Repair Costs

Figure 4.1: General applications of RFID technology in the aerospace sector.

under development up to today are:

- Airline baggage tagging.
- Reduced wastage in food trolleys.
- Cargo tracking: improving operations.
- Parts.
- Freight: enabling the IAT e-freight initiative.

The potential amount that RFID baggage tagging can save amounts to 760 million a year and is therefore worthwhile tacking. In some cases the saving has been very high - in Hong Kong airport (pioneer project for baggage tagging) for example, the average cost of handling bags has gone from $7 per bag to $4 - a huge saving. By early 2008, more than 30 airports were using/trialling RFID for baggage handling. The major roll-out at Hong Kong is beginning to be done elsewhere - including now at Milan airport.

As an example of the application of RFID in airliners, we can find Flybe Airline, that has tagged those items which presence in the aircraft must be compulsorily checked before a flight (manuals, life jackets, etc.). Flybe has got an important decrease in the time needed to check all these items, thus reducing the time between flights and being able to get more out from their aircrafts.

Finnair Airline claims that the use of IBM's RFID solutions has enabled the Finnair group to bring rapid improvement in the efficiency of its airport operations at Helsinki-Vantaa International Airport [19]. IBM is taking the charge of the innovative solution for the allocation of employee tasks at Northport Ltd. Northport Ltd is the major supplier of ground handling services. It is also a member of the Finnair Group. IBM has agreed to work on a three-year project for the leading operating airlines. Nokia provides wireless technology for the IBM RFID solution.

Probably the hottest growing market segment for RFID applications in the world right now is asset tracking. Asset tracking finds its way into applications inside and outside of the airline industry with a huge range of different characteristics – from the smallest indoor office asset to trucks in yard management applications. The airline industry has the same sorts of things and a great example are the trolleys that are used to move food and other supplies into and out of the airlines.

Another example are the utility vehicles that are used to carry baggage to some of the larger aircraft and the entire unit filled with bags is actually lifted and put into the airplane itself. These assets tend to be shared, they can be lost, they need frequent maintenance – basically they need significant levels of management in order to be used effectively and cost effectively. Tagging them with RFID so you can track their maintenance schedules and know

where they are is very beneficial and beings the same benefits to the airline industry that asset tracking brings to industries all around the world.

Just to be concern about the impact of RFID, a list of developed or under development RFID projects is shown in Table 4.3.

BAGGAGE
Las Vegas McCarran International Airport, , USA
Malpensa Airport, , Italy
Seattle Airport SeaTac Terminal, USA
Asiana Airlines, tracking and monitoring, Korea
Auto-ID Laboratory air Hong Kong/ US
KLM and Air France, , The Netherlands, France, Japan
Delta Airlines/Jacksonville Airport Authority , USA
Heathrow International Airport collection, UK
Helsinki Vantaa International Airport, , Finland
Hong Kong International Airport, tracking, China
KLM Airline, , The Netherlands
Korea Airports Corp., Incheon, Gimpo&Haneda Airports
Lan Chile Airlines, , Chile
Savarnabhumi Airport, , Thailand
Singapore Airlines , Singapore
San Francisco International Airport, USA
CONVEYANCES (ULDs, trolleys, etc)
Hong Kong International Airport, food trolley hangers, China
Sepang Airport, food trolleys, Malaysia
KLM food trolleys, Holland
Air Canada, tracking trolleys, Canada
Envirotainer air cargo, Europe
Arlanda Airport baggage pallets, Sweden
TNT Express, air containers, Europe

VEHICLES AND TRAILERS (buses, taxis, cars, GSE, etc)
Vantaa Airport taxis, Finland
BAA, taxis at Heathrow International Airport Steria System, UK
BAA taxis at Heathrow Int. Airport, original TransCore system UK
Charles de Gaulle Airport taxis, original system France
Arlanda Airport, employee vehicle parking, Sweden
Dallas Fort Worth Airport International Highway vehicle tolling, USA
Dallas Fort Worth Airport vehicle tolling USA
Delta Airlines, GSE vehicles, USA
Heathrow Airport, GSE vehicle access control, UK
John Wayne Airport, ground traffic USA
Los Angeles and Orange County Airports road tolling, USA
Newark Liberty International Airport, Vehicles, USA
Zurich International Airport baggage wagons, Switzerland
Vienna International Airport GSE vehicles, Austria
CARDS, TICKETS, BADGES, ASSETS
Frankfurt Int. Airport, assets requiring maintenance, Germany
IATA Airlines, E- ticketing project, worldwide
Lubbock Preston Smith International Airport parking card, USA
Lufthansa frequent flyer card, Germany
Manchester International Airport, people, UK
Newark Liberty International Airport, Trusted Travellers' card, USA
Schonefeld, Tegel and Templehof Airports card access, Germany
Southwest Florida International Airport, access cards, USA
Swissair/Sabena loyalty card, Switzerland, Belgium

Table 4.3: RFID projects developed in airlines and airports

Chapter 5

RFID technical description

This chapter analyzes the current situation of RFID technology from the technical point of view. As it is explained in the previous chapters, this technology has changed significantly in the recent decades, but fortunately it has reached the point in its evolution when it is mature enough so that it can be widely deployed through a standard.

The following section describes the fundamentals of RFID (e.g. how it works). Following this point, the main components and the design objectives of an RFID system are presented in Section 2 and 3, while an explanation about the way to decode RFID data is given in Section 4. In sections number 5 and 6 an overview over the standards is given and the possibilities of the large scale standard EPC Global Class 1 Gen 2 are explained in a more technical way. Section 7 analyzes the main possibilities of RFID over its main competitor and nearly unique deployed tagging system: Barcodes. To finish with, Section 8 describes an experiment to analyze the cost benefit impact of using an RFID for a tracking system.

5.1 Fundamentals of RFID

A standard RFID system comprises Interrogators, also known as Readers, and Tags, also known as Labels.

Standard RFID tags are paper-thin and work well when used on cardboard boxes, but if the tag is placed on a metal surface it doesn't operates properly. Passive Metal Mount UHF tags solve this problem by providing a dielectric separation between the antenna and the metal surface.

An Interrogator transmits information to a Tag by modulating an RF signal in the 860 MHz - 960 MHz frequency range. The Tag receives both information and operating energy from this RF signal [20]. Tags are passive, meaning that they receive all of their operating energy from the Interrogator's RF waveform.

An Interrogator receives information from a Tag by transmitting a continuous wave (CW) RF signal to the Tag; the Tag responds by modulating the reflection coefficient of its antenna, thereby backscattering an information signal to the Interrogator. The system is ITF, meaning that a Tag modulates its antenna's reflection coefficient with an information signal only after being directed to do so by an Interrogator.

Interrogators and Tags are not required to talk simultaneously; rather, communications are half-duplex, meaning that Interrogators talk and Tags listen, or vice versa.

5.2 Main Components of an RFID system

The entities that take part in an RFID system can be different according to the company's needs, but the main components are always the same: Tags, Readers, Printers, Middleware, Servers and Company Applications [21].

5.2.1 Tags and Readers

Tags and Readers are the main components of an RFID system. Tags can be either active (battery needed) or passive (no battery needed), and can work on different frequencies. These are the ranges and uses for the different frequencies where RFID works:

- Low Frequency (LF- 125KHz): Few centimeters. Used for access controls (tokens, cards).
- High Frequency (HF- 13,56MHz): Several cm.
- Ultra High Frequency (UHF- 860-960MHz): Some meters, from 3 to 10. It allows access to several tags at the same time. Used for inventory management, item tracking...
- MicroWave (MW: 2,45GHz): Only for active tags. Several meters. Used in toll barriers.

As mentioned above, active tags have more range than passive tags, but they also are more expensive and need more maintenance. Therefore, passive tags are much more frequent and they currently have a rapid expansion utility. Their cost depends on the frequency they work on (a HF tag has more copper in the antenna and generally costs more than a UHF tag), the amount of memory, the design of the antenna and the packaging around the transponder. The typical price of a UHF tag ranges from 0,08€ to 1€.

With regard to readers, they range in price from 350€ to 3.000€, depending on their functionality. Some of them have very limited computing

power and others can filter data, store information or execute commands, as well as communicate using different protocols, frequencies or with several tags at the same time. They can be portable or fixed, and they normally use Ethernet, Wi-Fi or USB ports to communicate with the integrated system.

5.2.2 Printers

Printers are used to write the desired information in the tags as well as to write the labels with visual information that might be needed to complement the stored data. They normally cost around 2.000 - 3.000€. Printers are only needed once in each tag, as the reprogramming and rewriting of data are made by the readers.

5.2.3 Middleware and Servers

Middleware is a generic term used to describe software that resides between the RFID reader and enterprise applications. It is of critical importance, as it is in charge of taking the raw data from the reader, filtering it and passing it to the right application. There are different RFID middleware products on the market: some of them manage and configure RFID readers, other are able to send software updates, and some others can even handle data from external databases or manage their own applications for an specific industry. For example, they can automatically send a notification to the responsible when a certain product is missing or out of date.

The cost of middleware varies from vendor to vendor and is usually based on the number of locations where it will be installed, the complexity of the application and many other factors. According to Forrester Research, the approximated cost of middleware for a 8.500M€ manufacturer is around 0,13M€ , which is a 0,015% of the turnover.

With regard to servers, an enterprise will also need to purchase them to run middleware within their facilities. These servers are called edge servers as they are in the edge of the digital and the real world, as they are the last physical entity in the chain. They typically do not have any special hardware, and they connect to readers using serial or Universal Serial Bus (USB) ports.

5.2.4 Enterprise Applications

The companies need to develop or modify their applications so that they can make use of RFID data. There have already been companies that have upgraded their applications to make profit from the fact that RFID enables a unique identification of each single product.

Enterprise Resource Planning (ERP) software providers, such as SAP and Oracle, are also working to upgrade their applications, and this process will extend to all the applications as long as RFID adoption spreads and companies learn how to use RFID data to improve their operations. The cost of these applications usually depend on the number of users, locations and other factors.

5.3 Design Objectives of an RFID system

When designing an RFID system, you should first understand and consider two key aspects of turning RFID data into useful information. First, you need a way to convert the raw incoming RFID data into a meaningful context for further processing and subsequent actions. Because today's marketplace provides an abundance of RFID tag choices, data encoding formats, and custom data options, you'll need a powerful and flexible encoding and decoding architecture to support applications now and into the future.

Secondly, while it might be relatively easy to build an RFID data acquisition and analysis system for the number of tags your business uses today, you have to consider the future. The system must be able to avoid data overload when your system collects data from hundreds of thousands of RFID tags. Filtering and smoothing are important concepts to understand; early in the design process you need to identify architectures that provides flexibility in processing data at the point of activity.

5.4 Decoding Raw RFID Tag Data

Any discussion about making RFID data usable must begin with a discussion about how raw RFID tag data actually looks as it comes into your enterprise from RFID readers.

RFID tags used in the supply chain are encoded with an Electronic Product Code, or EPC, which is a globally-unique identifier for the object being tagged. There are a number of different encoding formats; which one a particular tag uses depends on the tagged item. These formats can be specific to groups of goods, such as shipping containers, or can be specific to each individual asset type. To ensure that each EPC is unique, EPCglobal (the organization driving standards for EPC) assigns each company a unique manager number. Each company is then responsible for assigning the other fields required by the encoding format being used.

RFID readers typically return the raw HEX or binary representation of an EPC, values which must then be decoded using bit-level programming to derive a useful representation of the information that a tag holds. As an example, an RFID reader may read and output a HEX value of

30700048440663802E185523. This value must be converted to binary, then decoded programmatically according to the EPC specification to extract the decimal field values, and finally, formatted to return a meaningful representation of the EPC called the Uniform Resource Identifier (URI) representation.

The binary representation of the tag HEX value shown above is (note that the two lines below represent a single value):

00110000011100000000000001001000010001000000001100
11001000000000000010111000011000010101010100100011

The EPC tag specification [22]outlines the decoding process, which you can follow by interpreting the binary string bit by bit to get a more useful representation.

After decoding the binary value, the URI representation of the tag above is:

urn:epc:tag:sgtin-96:3.0037000.06542.773346595

That value must be processed further to determine the item it actually represents. The URI representation is often used for reporting, as it is easier for programs or individuals to extract meaningful information about the tagged item from that representation than from HEX or binary values, by filtering or grouping on the various fields.

The tag in this example is a 96-bit EPC value encoded using the Serial Global Trade Identifier Number (SGTIN-96) format, as indicated by the sgtin-96 field in the URI representation or the eight-bit constant at the start of the binary representation. The SGTIN-96 tag data specification requires six fields to be set for each tag; the combination of all six fields ensures each tag's uniqueness. These six fields are:

- Header, which is 8 bits and is common for all SGTIN-96 tags.
- Filter, which is three bits and specifies if the tagged object is an item, case or pallet.
- Partition, which is three bits and indicates how the subsequent fields are divided to get the correct data for each.
- Company Prefix, which is 20-40 bits (depending on the Partition) and contains the company's EAN.UCC Company Prefix.
- Item Reference, which is 24-4 bits (depending on the Partition) and contains the item's GTIN item reference number.
- Serial Number, which is 38 bits and contains the item's unique serial number.

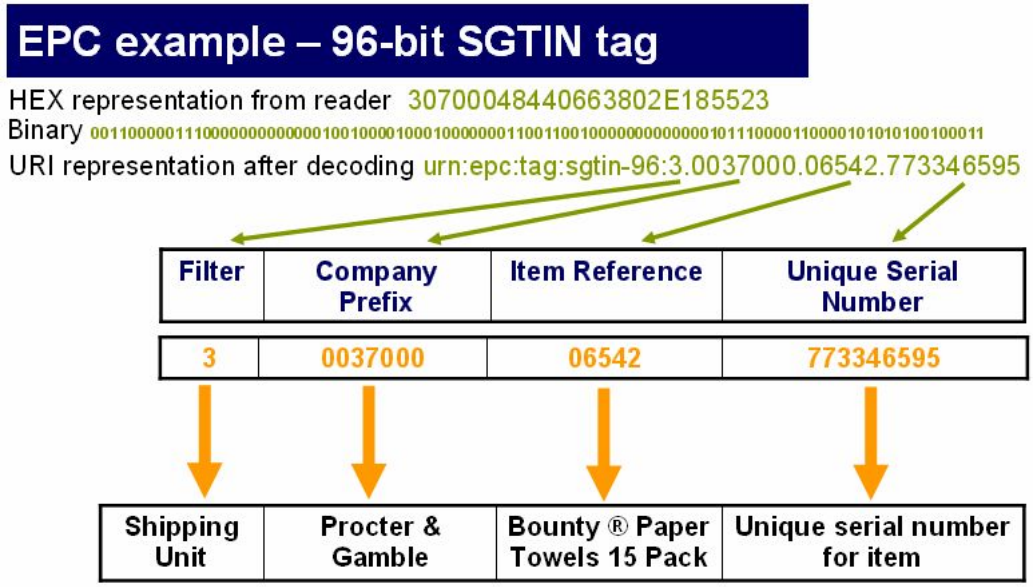

Figure 5.1: Decoding an EPC SGTIN-96

In the tag example used here, the URI representation urn:epc:tag:sgtin-96:3.0037000.06542.773346595 indicates that the tag is an SGTIN-96 tag that has a Filter value of 3 (meaning that it is tracking a shipping unit), a Company Prefix of 0037000 (Procter & Gamble), an Item Reference of 06542 (Bounty Paper Towels 15 Pack) and a Serial Number of 773346595, which uniquely differentiates that item from others of the same type. Figure 5.1 shows the breakdown of the tag fields.

The International Standards Organization (ISO) defines a number of other RFID tag standards governing the data stored on RFID tags. A number of these standards, such as ISO 15693, specify how data should be stored on a tag, but provide flexibility as to what that data can represent. In these cases, the custom data field of a tag can contain any data the company wishes to store on the tag in whatever format the company wants.

Other ISO standards exist for tags used in specific industries; these govern what data should be stored on a tag. For example, the ISO 11784 standard specifies that the data on a 64-bit RFID tag used for electronic animal identification must store three fields: a control field of 16 bits indicating animal or non-animal application, a country code field of 10 bits, and a national identification code of 38 bits. This standard also reserves a number of bits for future uses.

Whether you are using EPC or ISO tags, decoding tag data requires detailed, bit-level programming to convert the raw tag data from binary or HEX into business information. In an RFID system that tracks both ISO tags and EPC tags of varying encoding formats, tag decoding tasks can involve significant research and low-level programming resources. To accomplish this task correctly, developers must work with fairly complex specifications -often for multiple tag formats- within their application, all of which can add up to

a significant amount of new code.

Thus, the decoding efforts involved in building a flexible RFID system can be reduced by adopting an RFID middleware platform to perform the decoding tasks automatically, exposing decoded, meaningful data to applications and business logic through easy-to-use interfaces and development options.

5.5 Different RFID standards

Over the last decade a great deal of work has been going on to develop standards for different RFID frequencies and applications [23]. The definition of the RFID standards is based on the 4 following areas:

- Air interface protocol: Specifies the way RFID tags and readers communicate via Radio Frequency (RF).
- Content of transmitted data: Specifies the format and semantics of the data sent between the tags and the readers.
- Certification- Conformance: Tests that the products must pass to ensure they meet the standards and that they can interoperate with devices from different manufacturers.
- Applications: type of use of the RFID systems.

The International Organization for Standardization (ISO) has created several standards of RFID for different applications such as cattle tracking, payment systems, or goods tracking in the supply chain.

In 1999, the Auto-ID Center was set up with the mission of developing a low-cost RFID system that could allow that the tags could be disposable, as the tags put by the manufacturer will not be given back by the retailer, obviously. It had to operate in the ultra-high frequency band (UHF), because only this frequency delivered the read range needed for supply chain applications such as reading pallets coming through a dock door. The Auto-ID Center also made a special effort to make the whole system global and based on open standards. As a matter of fact, once they developed their own protocol, they licensed it to EPCglobal on the condition that it would be made available royalty-free to manufacturers and end users. The Center planned to have one protocol that could communicate with different classes of tags, that where initially defined in the following way:

- **Class 0:** A simple, passive and write-once tag that uses a subcarrier modulation scheme for the tag-to-reader link.
- **Class 1:** A simple, passive, read-only backscatter tag with one-time, field-programmable non-volatile memory.
- **Class 2:** A passive backscatter tag with up to 65 KB of read-write memory.
- **Class 3:** A semi-passive backscatter tag, with up to 65 KB read-write memory; essentially, a Class 2 tag with a built-in battery to support increased read range.
- **Class 4:** An active tag that uses a built-in battery to run the microchip's circuitry and to power a transmitter that broadcasts a signal to a reader.
- **Class 5:** An active RFID tag that can communicate with other Class 5 tags and/or other devices.

First of all, the Auto-ID Center adopted Class 0 tag, but not much later started with Class 1. Unfortunately, to read them both it was necessary to buy multiprotocol readers, and the same happened with the following classes.

In 2003, the Auto-ID Center split into different organizations, but the primary research kept being on EPC technologies. As a result of this, EPC global launched the second-generation protocol (Gen 2) in 2004, with the aim to create a single, global standard that would be closely aligned with ISO standards.

The International Standardization Organization has developed ISO 18000 series to cover the air interface protocol for systems likely to be used to track goods in the supply chain. They have 7 different frequency bands where RFID is allowed to work, and EPC global's Gen 2 standard could be submitted to ISO under 18000-6, which works between 860 and 930MHz.

5.6 EPC Global Class 1 Gen 2 Specification

The described standardization process has reached a level of maturity enough to choose a certain standard for a large scale project. This is the case of EPCglobal Class 1 Gen 2 Specification, the standard chosen by the largest global drivers for RFID, like Wal-Mart and the U.S. Department of Defense.

This specification helps to solidify the adoption of RFID in the UHF band for worldwide deployment by addressing emerging UHF regulations in different regions and improving the best features of the preceding UHF specifications as well as anticipating a range of future applications and product extensions.

The main benefits over the previous protocols could be summarized in the following aspects:

- **Faster, more reliable read and write speed:**

  Class 1 Gen 2 provides four different communication speeds to provide more flexibility for different operating environments. In high noise environments it can read about 100 tags per second, while in low RF noise environments it can reach the amount of 1.000 tags per second. Regarding write speeds, Gen 2 sets the target of 30 tags per second, which would allow RFID integration and programming in most high-speed assembly and packaging lines. However, currently the speed is about 5 per second.

- **Higher reliability in tag counting:**

  As RFID tags receive only brief and interment moments of power from the reader, a protocol to handle the short and simple query/acknowledgement interchanges between the readers and the tags is needed. This is called the Q protocol. It issues a query and each tag responds with a randomly generated number that is used in the following messages between the two entities. Therefore, all tags can be identified uniquely.

  Furthermore, it is also possible to quiet tags after they have been read, which enables to read tags further away, as there is less noise in the environment. Moreover, a multiple wake-up function is also implemented.

- **More robust performance of many readers in close proximity:**

  When there are many readers in an environment, the fact that they shout their commands to tags and they receive only whispers as a response can provoke that whispers are covered by too many shouts. However, Gen 2 deals with this by using different channels in the frequency and separating tag transmissions from reader transmissions. In Europe, for example, readers would be confined to even-numbered channels and tags to odd- numbered channels.

  Gen 2 also anticipates situations where there are several readers communicating with a single tag at the same time. This is managed by using sessions to communicate with various readers in parallel. There are 4 different sessions available, and the monitoring and allocation of sessions can be managed via readers or via a central control point.

- **Enhanced security:**

  The new specification uses 32-bit passwords for a higher security and privacy. They are used for activating kill commands, for shutting down tags permanently and for accessing an relocking a tag's memory.

  In case an external entity tries to decode the ID tag by analyzing the data sent over the air, the Q protocol never requires the entire tag ID. Furthermore, it sends the signals so scrambled that the EPC numbers are virtually impossible to determine.

Gen 2 also introduces several handle-based commands for securely interacting with tags while following the right communication sequence.

- **Extensibility to higher-function tags and systems:**

  The EPC Class 1 Gen 2 specification anticipates anticipates and plans for higher-function systems. For example Class 2 systems add larger memory tags, higher levels of read-write functionality and even higher security. Class 3 is thought to provide longer read ranges and to be able to communicate sensor-based data such as temperature or pressure. However, this requires a battery on the tag.

  All these classes will be readable by EPC readers, which makes possible to extend the functionality of an established RFID system.

  As an overview of the EPC Class 1 Gen 2, the following table offers the main features of the described standard:

Feature	Class 1 Gen 2
Read rate (reads per sec)	Up to 880 (US FCC). Up to 450 (EU ETSI). Speed adaptable to RF noise in environment
Write speed (for 96-bit EPC)	5 tags per second minimum. Rewriteable many times.
Tag sorting protocol	"Q" protocol: a random number algorithm with 2 persisteng symmetric states (enables counting of multiple tags with same EPC, and on -the-fly adaptation to size of tag population).
Tag data verification	16-bit CRC (Cyclic Redundancy Check) for reads and writes.
Multiple reader operation	Frequency hopping (US FCC). Listen-before-talk (EU CEPT). Dense reader modes (channelization, variable subcarrier modulation). Four reader "sessions", allowing pararell communication by multiple readers with one tag.
Security	32-bit lock and kill passwords. Option for "handle"-based communication.
Extensibility	Up to 512 bit item ID. Unlimited user memory. Anticipates Class 2 & 3 systems

Table 5.1: Class 1 Gen 2 specifications

5.7 Advantages of RFID over Barcodes

Barcodes are optical machine-readable representations of data. They were invented in 1948 and only three years later they were almost universally used after their application in supermarket checkout systems. Since then, barcodes have been the main identification system used over the last 60 years for the vast majority of goods sold due to its simplicity, universality and low cost.

However, in the last decade an important alternative has been proposed: RFID. This technology is not as mature as barcodes, but its high potential is so significant that it may now be profitable to use RFID given the fact that the additional capabilities it offers cover the difference in prices that still exists. As a matter of fact, the cost of using a barcode is around 0,003€, while the cheapest RFID tag still costs around 0,05€. For further information about the profitability of an RFID tracking system, a detailed cost-benefit analysis will be made in Section 8 of this chapter.

As overall criteria, a RFID tag will be convenient in every case where its additional cost will be covered by the added value of the service provided. Table 5.7 shows a comparison of barcodes and RFID tags within different parameters that are used to decide between the two options [24].

Obviously, some services may not require as many parameters as others. For example, logistics has different requirements than maintenance tasks or medical applications. Therefore, this doesn't mean that RFID is necessarily better than Barcodes, but it is true that it offers significant advantages in many circumstances. Basically, it depends on the level of control and management that a product or service requires.

	RFID	Barcodes
Read rate	High throughput. Multiple (more than 100) tags can be read simultaneously.	Very low throughput. Tags can only be read manually, one at a time.
Line of Sight	Not required. Items can be oriented in any direction, as long as it is in the read range, and direct line of sight is never required.	Definitely required. Scanner must physically see each item directly to scan, and items must be oriented in a very specific manner.
Human Capital	Virtually none. Once up and running, the system is completely automated.	Large requirements. Laborers must scan each tag.
Read/Write Capability	More than just reading. Ability to read, write, modify, and update.	Read only. Ability to read items and nothing else.
Durability	High. Much better protected, and can even be internally attached, so it can be read through very harsh environments.	Low. Easily damaged or removed; cannot be read if dirty or greasy.
Security	High. Difficult to replicate. Data can be encrypted, password protected, or include a "kill" feature to remove data permanently, so information stored is much more secure.	Low. Much easier to reproduce or counterfeit.
Event Triggering	Capable. Can be used to trigger certain events (like door openings, alarms, etc.).	Not capable. Cannot be used to trigger events
Unique Identification	Capable. Each product is different than the others of the same type.	Not capable. All products of the same type have the same barcode

Table 5.2: RFID vs. Barcodes

5.8 Cost Benefit analysis of an RFID tracking system

This section outlines the cost-benefit analysis of using Ultra High Frequency (UHF) RFID technology in an asset-tracking application. This is done by comparing the different costs and benefits associated to RFID and Barcodes in several experiments that are described. The obtained results can be extended to a different case with reliable accuracy [5].

To start with, the needs for Asset Tracking are the following:

- Security.

- Search for missing items.
- Annual Stock take.
- Deploy, repair, relocate, refresh and return.

The Australian Company Ramp, which is the World's leading Content Optimization Platform, did some experiments about that outline the operational time savings involved in using RFID technology in comparison with both barcoded and manual systems. Their experimental results concluded that the time saving of RFID over Barcodes was of 90,82%.

In order to convert this time reduction to cost, they used an example based on the following hypothesis:

- Average warehouse worker working 38 hours a week with a total staff cost of 39.000 €.
- Number of assets to be tracked: 4 different amounts calculated:
  - 10.000
  - 20.000
  - 50.000
  - 100.000
- Asset Life: 3 years.
- Initial Deployment of Asset:
  - Manufacturer applies RFID tag to asset.
  - 5 reads: reception and distribution to the correct shelf of the operation location.
- Yearly Operational Reads:
  - Stock take: 100% of assets.
  - Redistribution of assets: 60% of assets.
  - Office Redesign/Relocation: 50% of assets.
  - Intra-organisation Support/Repair: 40% of assets.
  - Manufacturer Warranty (Replacement or Repair): 5% of assets.
  - Redundancy of asset: 33% of assets.
  - Searching for lost assets: 1% of assets.

This experiment has lead to a Cost Benefit per Read of 5,37 cents of Euro. Table 5.8 lists the Annual Cost Benefit compared to the number of assets according to the initial hypothesis:

Number of Assets	Reads per Asset per Year	Annual Labour Cost for Barcode	Annual Labour Cost for RFID	Annual Cost Benefit
10.000	14.11	8.480€	908€	7.572€
20.000	14.57	17.500€	1.875€	15.625€
50.000	16.06	48.250€	5.160€	43.090€
100.000	18.71	112.450€	12.050€	100.400€

Table 5.3: Annual Cost Benefit compared to number of assets*RAMP Solutions*

As it can be seen, Table 5.8 states that an organization with 100.000 assets would have annual cost savings of around 100.000€. This cost saving carries forward into perpetuity. However, this is not the only concept of saving of RFID, as there are other less tangible concepts (which depend on the different organizations and industries) that are positively affected by an RFID solution and must be taken into consideration:

- Utilization rate optimization of the existing assets.
- Productivity increase through more accurate data recording.
- Security and theft prevention.
- Reduction of out-of-stock situations.
- Brand enhancement.

Therefore, the amount of money to be saved by a company by using RFID is big enough to consider its acquisition in the short term, as the benefits are tangible since the very first moment.

Chapter 6

Internal Analysis

6.1 Internal Analysis Overview

In this chapter, we will try to analyze AIRFID internal factors affecting the performance of the company. Internal analysis will permit us to draw a strategic profile of the company, identifying what are its weaknesses and strengths. That information, besides the external analysis that identifies opportunities and threats by making a deep research of the environment of the company, will set the basis of a complete strategic study of the company and consequently will drive the decision process to determine the strategic objective.

The objective of an internal analysis is to identify the Key Business Factors (KBFs). KBFs are those factors that represent the activities, departments, resources, etc., that have a direct impact on the results and performance of the company, and which status is needed to be known, in order to know and anticipate to the possible effects that may cause, and place the adequate resources to avoid or to mitigate these effects.

The internal analysis of each firm is different, as any firm is unique. It means that a company can identify a set of KBFs different from its competitors sets. Anyway, it can be assumed that the set of KBFs can be grouped in several generic KBFs, which, in this case, will allow us to benchmark our firm with the competitors. When doing that benchmarking, we are getting an idea of the situation of our company with respect to competitors, and thus, we can establish the correct measures to eliminate or mitigate negative differences, and to reinforce positive differences. These measures will be derived from the general strategic objective, which will be developed in next chapters.

Before entering the study of KBFs, it´s needed to say that AIRFID is a new creation company. That means that the KBFs that will be shown and analyzed are those which are expected to be the most important in the operation and performance of the company. The logic and correct way to

proceed would imply periodically revisions and evaluations of KBFs from the moment the company starts operations, in order to correct any possible deviation from this initial evaluation. Also, as it will be explained later, as the KBFs are identified and consolidated, must be integrated in the normal operation of the company, to quickly supervise their status and evolution.

6.2 Key Business Factors Identification

KBFs of any company can be grouped and reduced to a set of basic factors that can easily show the situation and strategic profile of the company. These basic factors are:

- Economic factors.
- Financial factors.
- Commercial factors.
- Productive/Operational factors.
- Research and Development (R&D) factors.
- Human Resources factors.

In the next lines, each factor will be broken down and evaluated.

6.2.1 Economic Factors

As a starting company, AIRFID economical factors are difficult to evaluate, but we can show what we think are the most common sense factors that will allow the company to monitor the economic performance:

- **Cash position:** As the company starts operations, social capital plus sales derived from reached milestones plus external financing are expected to cover the costs incurred during initial phases, allowing us having a certain level of cash. A good way to measure it in the initial phases is respect to social capital.
- **Milestones per year:** As the company offers turn-key projects, money inflows are produced as the result of reaching milestones. When a project is contracted, milestones are agreed with the customers. Each milestone represents an amount of money to invoice. Milestones invoiced value per year, respect to commercial plan, is a good indicator of the economic performance of the company.

- **Return on equity (ROE):** There is no previous data for AIRFID as it is a starting company. It is expected a low ROE during the first two years, while capacities are still limited and as a consequence, the possible customers to attend.

6.2.2 Financial Factors

- **Possibility to get the cheapest debt:** Asking for external debt will be needed in order to operate, as it is explained in the financial part of the project. As a new creation company, with limited economic resources and assets, and lack of previous relationships with banks, it iss expected to get not very favorable conditions on the loans asked.
- **Possibility to get equity at any moment:** If needed, extra capital from shareholders could be needed. Taking into consideration the risks associated to a starting company without consolidated customers and market, could be difficult to find equity from new shareholders.

6.2.3 Commercial Factors

- **Capability to reach a wide range of customers:** At a first moment, as AIRFID is focused in the aeronautical sector in the Andalusian region, and, in order to provide a careful and professional attention to the first customers, the capabilities to reach customers from other sector, or from other regions in the same sector, could be very limited.
- **Capability to cover technical aspects and provide professional consulting services:** As the commercial department will be controlled or formed by engineers, given the nature of the products/services sold, it´s expected to have the technical skills necessary to cover any kind of technical consultation.

6.2.4 Productive/Operational Factors

These factors are related to the daily operation of the company regarding the operations that are carried out: purchasing, design, development, after-sales, etc.

- **Purchasing/producing capabilities:** As the company main role during the first moments is to develop a product/service, not to produce the tags and readers, some purchasing power and capabilities will be required to acquire the materials necessary in the projects under contract. According to commercial, operational and financial plans, important deviations over the planned purchases could be difficult to afford.

- **Flexibility to adapt to demand and specifications:** A limited number of skilled employees will form the core of the company, and according to demand changes over the operational plan, a number of temporary workers (which of course will receive appropriate training) will be hired. The major objective of the company is the customer satisfaction with the product/services, and from that point of view, flexibility against changing environment/specifications is a golden rule in the company.

- **Business intelligence and information update:** A key function of AIRFID members is to maintain regular meetings in order to discuss the latest advances in the sector, state-of-the-art technology, new entrants, new competitors, possible market niches, etc. The quality and effectiveness of these regular meeting must be measured and controlled, expecting high performance.

6.2.5 Research & Development Factors

- **Design and Development capabilities:** As a core activity of the company, development of customized products is a pillar in the business strategy, and thus, special equipment and software necessary will be acquired according to directives of operational and financial plan, in the first year of operation.

- **Research expenditure to sales ratio:** Once the products under contract are being developed, new products/services that can add value to our customers must be developed, according to needs detection. Research will be a must in the company, always according to financial capabilities an after appropriate priorization.

6.2.6 Human Resources Factors

- **Employee's training and capabilities:** As a key factor to ensure the business success and competitiveness, the personnel hired in the company must be selected amongst professional from the sector with contrasted reputation and background. Annual training programs will be carried out to keep up-to-date the company best intangible assets, the employees.

- **Employees satisfaction:** Another important target in the company will be the employee´s satisfaction, as a key factor to improve productiveness and motivation, and translate it into a competitive edge. An employee satisfaction program must be held and followed in the company. As AIRFID is a young company, with young, trained and motivated employees and important challenges, this is a strength of the company.

6.3 Company Strategic Profile

With the KBFs analyzed, a company profile can be established (see Figure 6.1. The company profile (green line) will show the basic factors, with the corresponding evaluation. In the same graph, the company profile of the standard in the sector (blue line) is shown (approximate and averaged information from the external analysis, where competitors are analyzed). By showing both profiles, AIRFID and standard sector company's profile, strengths and weaknesses of our company can be easily determined at a view. With that information, preventive and corrective strategic measures to eliminate or mitigate the effects (in the case of a weakness) or to reinforce the effects (in the case of a strength) can be determined.

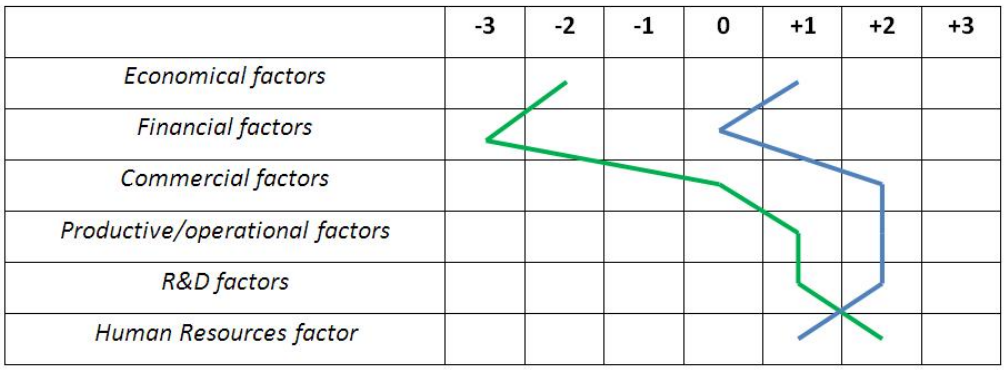

Figure 6.1: Strategic Profile of AIRFID

In the next sections, this information will help us to determine the company's weaknesses and strengths, in order to develop a DAFO analysis and establish the strategic objectives of the company.

Chapter 7

External Analysis

7.1 Introduction

External analysis is undertaken to enable an understanding of how the external environment has or will change so that the opportunities and threats which may arise by these external changes can be assessed so that appropriate action is taken [25]. AIRFID S.L considers that this section is crucial for the strategic analysis, and therefore for the success of the company.

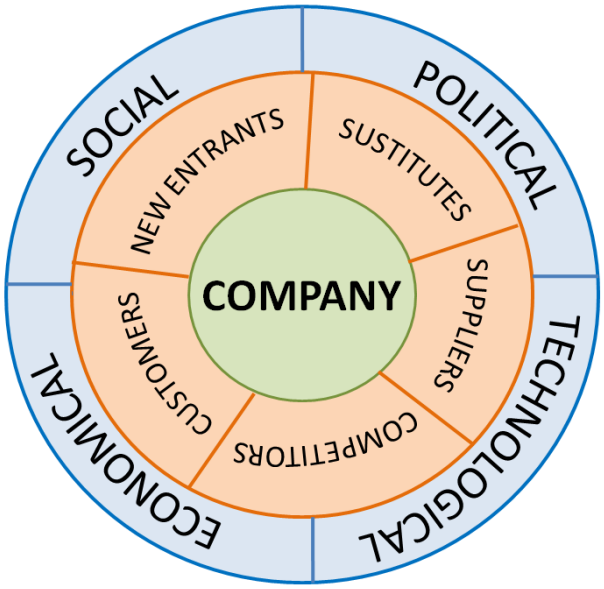

Figure 7.1: External Analysis

Figure 7.1 shows the classic division of the business environment into two steps or categories: the nearby environment, also called the microenvironment or the specific environment, and the wider environment (macroenvironment or non-specific environment).

At the centre of the graph is the company, the central point of our activity. Then the first circle as we move outwards includes factors in the nearby environment or microenvironment competitors, customers, suppliers and the threats of possible substitutes or of new entrants. These are the so-called competitive forces (M. Porter).

In the outside circle there are the factors in the general environment or macro environment which are the political, social, economic and technological factors.

In general terms, changes in the outer environment have less impact on a company than the ones in the inner environment.

The general structure of the chapter is organized as follows: First of all, the Macroenvironmental Analysis will be explained, covering some aspects as the Political, Economical, Socio-cultural, Technological and Legal analysis. After this, the Microenvironmental Analysis will be described, which studies the new entrants, substitutes, purchasers, suppliers and competitive rivalry. Finally, a more extended competitors and suppliers analysis is done with the main companies AIRFID S.L. will deal with.

7.2 Macroenvironmental Analysis

The Context Analysis will allow us to have a global vision of the environmental situation for strategic purposes, and to figure out the present trends of these parameters to determine whether they could affect to our organization. In our business plan, we are going to use a PESTEL Analysis. This acronym stands for Political, Economical, Socio-cultural, Technological, Environmental and Legal Analysis, and describes the current situation of the main global parameters that define the macroeconomic environment in which the company will develop.

Obviously, external factors are rarely universal, and they are much influenced, if not determined, by the location where the company will settle. The location of AIRFID is still to come further in this document, with the purpose of making a reasonable External Analysis we get ahead announcing that our company will settle in Andalusia.

As a general case, these are the main factors that should not be overlooked when performing the PESTEL or SLEPT analysis of any company: Social, legal, economic, political and technological factors.

- **Political Analysis:** Political sector investment, public attitude, impacts of activity on environment, protected areas, employment laws, political pressure groups, initiatives in favor of entrepreneurial activity, governmental stability.

- **Economic Analysis:** GDP evolution, interest rates, monetary offer, price trends, unemployment rate, level of income, resource availability and distribution, level of development, economic cycle.
- **Socio-cultural Analysis:** Demographic structure and evolution, income distribution, social mobility, changes in the way of living, consumer attitudes, level of education, cultural patterns.
- **Technological Analysis:** Public expenditure in research, governmental and industrial interest in technology, obsolescence grade, maturity of the conventional technologies, new products development, transmission speed of knowledge and technology.
- **Legal analysis:** Laws and regulations, external commerce regulations, trade restrictions and tariffs, impeditive policies.

7.2.1 Political Analysis

Research, Development and Innovation policy provides the development of their programs in 2010 with a budget that amounts to 545.9 million euros, increasing its endowment over the previous year by 1.8%. In an environment marked by an austerity budget, the growth of funds available for this policy reflects the strong commitment of the Regional Government. Consequently, the aforementioned promotes the competitiveness of our product and the corresponding bid for a model of economic development where innovation and knowledge have a central role. In our case, AIRFID S.L will be an enterprise with a technological base and is included on this kind of policies.

The Andalusian government allocated for the budget in 2010 funds for the development of Economic Development policy and business, valued at 1137.7 million €. These allocations funds are added in 2010 investment available to the public business sector endowed with 124.9 million €, and the active funds available for allocations to small and medium enterprises and local authorities.

The development of the implementation of investment operations is equipped with 272.3 million €. The economic policy of the Junta de Andalucía, captured in their planning documents set the general strategic goal of improving the welfare of the Andalusians. Furthermore, among its priorities for action, it provides business development and innovation through a set of actions aimed essentially at achieving a greater number of companies capable of growing and competing in foreign markets [26]. The specific objectives of the Economic Development and Business policy in 2010 are:

- To increase the number of firms in Andalusia, in particular youth-driven and women.
- To increase business survival.

- To facilitate administrative procedures related to business and advance their implementation through the internet.

- To promote the internationalization of the Andalusian Company.

- To encourage the modernization and improvement of competitiveness. Betting on strategic sectors and innovative companies and technologically competitive.

  The impact of the current economic crisis in terms of business loss and destruction employment is causing a general reflection on the basis of current production model of the economy. In addition, it is ending the need for further efforts to reduce external economic dependencies and to promote economic growth that does not compromise the resources of future generations.

Industry Support in Andalusia

The Andalusian Plan for Industrial Development 2007-2013 stated as its goal the conversion of Andalusian Industry in a competitive industry based on knowledge and innovation, which is the engine development in the region and sustainable and socially responsible criteria. Thus, the strategic area of support to the industry envisages a target in 2010. Andalusia transforms the industry into one of the fundamental pillars that helps the economy to maintain the R&D position of Andalusia achieved in the last decade. Thus, it is considered to be one of the fundamental points that contributes to the strategy of revitalizing the economy.

This will be further developed in 2010 by the Productive Soil Andalusia Program (Prosper) in order to cover the demands of the productive Andalusian land. It attracts sources of innovation and excellence through the implementation, development and consolidation of leader companies in strategic sectors for the regional economy.

On the other hand, incentives of business investment will remain as central main policies in support of industry, on the slopes of creation, modernization, and competitive cooperation.

The budget of 2010 also provides financing for the Andalusia 2000E Plan, to support the renewal of the fleet, which will support the automotive sector in a situation characterized by lower demand for cars. The lines are complemented by temporary aid incentives to companies affected by a shortage or a sudden unavailability of credit, as a result of the financial crisis and global economy [27].

7.2.2 Economical Analysis

During the first three quarters of 2009, the Spanish economy continued the negative trajectory which was initiated in the second half of the last year, although the rate of decline is less nowadays [28]. Activity was moderate in the first quarter, when it reached the highest phase of contraction. The available indicators suggested that this pattern would have attenuated further in the October-December period, a decrease in estimated quarterly rate of GDP of 0,1% (-0,3% in the previous quarter), representing a fall in its annual rate of 3,1%, nine percent less than in the previous quarter[29]. For the expenditure side, domestic demand slowed its pace of decline, to an annual rate of -4,8%, while the contribution of net trade to GDP, positive for the seventh consecutive quarter, fell 5%, to stand at 2 percentage points (pp).

Year-end GDP has fallen at a rate of 3.6% in the whole of 2009, the largest drop in activity in recent decades, consistent with the severity of the contractionary tendencies that the global economy has faced over the last two exercises. However, in Spain, the imbalances built up during the prior expansionary phase have also contributed to the decreased activity. The decline in production resulted from the sharply decline in domestic demand from 6% in the average in 2009, which affected all components.

In the second half of the year, it suffered a slowdown of quarter-profile decline in expenditure, with increases even in the case of consumption and investment in equipment. It had an impact on direct aid to the acquisition of automotive vehicles while public investment reflected the implementation of the projects of the Local Investment Fund. Meanwhile, net external demand cushioned the impact of the contraction in domestic spending on the activity, with a positive contribution the GDP growth of 2.7 pp, the highest of the past decades, supported by the fall in imports, which were much higher than exports.

On the supply side, the decline in expenditures impacted all branches of production, but had particular impact on industry and on construction. All this carried out the process of job destruction, so that, on average, in 2009, the occupation would fall by 6.7%, which was more pronounced than that recorded in previous recessions. The expectations of employment deterioration eventually influenced the labor supply, which experienced a more moderate growth, to register a decline in the fourth quarter. In contrast with the dynamism of previous years, the unemployment rate rose up to 18% of the workforce (18.8% last quarter), according to the EPA (Encuesta de Población activa).

The improvement in economic and financial situation in recent quarters has identified a new upward revision of growth prospects of the global economy. However, there is a growing divergence in the strength of the recovery between areas and countries. The IMF, in the latest update of its forecasts, anticipated growth rates of 4% and the 4.3% for this year and 2011, respectively. Some questions remain on the extent of recovery, after the rede-

ployment of monetary and fiscal stimulus that has been in place. The main factors of uncertainty continue to be:

- The trend of the deleveraging of the banking and not financial private sectors.
- Labor market adjustment.
- Deterioration of public finances that appeared in the previous periods that has gained special relevance in some developed economies in recent months, with widespread increases in public deficits and debt.

In this context, special mention issues relating to possible exit strategies: The best time to remove the extraordinary monetary and fiscal measures-and how to do it to ensure sustained growth without jeopardizing the economic recovery and financial stability.

Nowadays, there is an important trend in order to reduce costs and increase productivity. By using RFID technology instead of other old ways to identify and track jigs and tools the operational costs can be decreased. As we can see in following chapters in this business case, using RFID in a standard company leads to a reduction of costs.

Geographic Analysis

Our business will be located in Seville and will offer services firstly in all Andalusia and after in all Spain, focused on aeronautical companies. In Andalusia there exist a lot of aeronautical companies where our services can be required. In the following table we can see the distribution in Andalusia. In the Marketing Plan there is a deeper analysis of the aeronautical companies in Andalusia.

7.2.3 Socio-cultural Analysis

Nowadays there is an increasing interest in cutting edge technology. Companies and public administrations are more and more aware of the importance of investing in new technologies. There are also high subventions to those companies that are innovative.

The use of these new technologies is being richly rewarded by public administrations that want to bet on a change in the production model of the country.

Taking into account the high degree of acceptance among employers and authorities, which are encouraging and focusing on such technologies, RFID is bound to be well received by the society.

7.2.4 Technological Analysis

RFID technology is applied in a lot of applications around the world. However, in Spain there is no company that can offer services with guarantee in the aeronautical sector and this explains why our company will focus in this sector.

Other aspects referred to technical features can be consulted in the Chapter 5 RFID technical description.

As described in Chapter 4, RFID is starting to appear in the aeronautical sector, companies like Boeing or Airbus are introducing this technology in their processes.

In Andalusia, the aeronautical sector grew significantly in turnover and employment during 2008, representing the highest weight gained in sales and job generation, and does so in a year when most other airlines with a great tradition of suffering some stagnation in job creation and even a decrease in sales. In 2008, the Andalusian aeronautical industry achieved sales of 1.417 million €, to 72% more than in 2007.

With regard to the job creation, the main objective for the Andalusian administration at this time was a 12% increase over the one it got in 2007 and again highlighting the ancillary industry with a 16% growth.

These data represents 23% of turnover and employment in Spain within the sector and definitely consolidates Andalusia among the main centres of European aviation. In addition, the aircraft sector iin Andalusia has grown 186% in turnover and 99% in employment since 2001.

The revenue grew specially in the final assembly companies (111%), large assemblies (81%) and, again, engineering (59%). However, the effort has been particularly notable for supporting industry in order to diversify Andalusian clients and participation in programs such as Boeing, Embraer, Eurocopter and Eurofighter, with an increase of 20% in revenues compared to 2007 with different manufacturers to Airbus Military and Airbus. In recent years, the weight of sales of the aviation sector in Andalusia has been multiplied, by three from 5% to 16% of the total.

Another element that is key for the strategy in the Andalusian sector is the creation of a Tier 1, Alestis Aerospace with a huge volume of work, which results in a large number of tools and jigs.

7.2.5 Legal Analysis

The use of radio frequency identification or RFID is raising serious concerns about the protection of citizens privacy by the new risks they pose to the exercise and its rights and freedoms.

In this context, the Article 29 Directive 95/46/EC sets out the main risks and proposals to avoid them when using this new technology. Therefore, it is necessary to define with precision its uses. In light of the working paper prepared and presented by the Group 29 of the European Commission, the Committee on Civil Liberties and Informatics has identified the most troubling risks as follows:

- **Identification of RFIDs purposes and problems arising from fraudulent interception of data:** This problem has appeared in recent years in U.S., causing irreversible damage in people who have had to cope with the harmful consequences of acts they did not commit. A widespread use of RFID to attacks and interception of personal data by unauthorized parties could generate more substantial risk for European citizens.
- **The development of techniques for tracing the movements and/or acts committed by individuals tracking:** This technology can locate at any given time individuals who carry on their clothes, car, etc., allowing constant monitoring. This new feature of massive data processing, which, beyond the development of new personality profiles of individuals, allows detailed monitoring of every step made, is a violation of his privacy.
- **Implementation of RFID in human bodies:** This is currently taking place in the field of biomedicine and has important ethical implications. Organizations such as the European Group on ethics have started a debate on the subject.

7.2.6 Conclusions

There are a huge number of reasons extracted from the background analysis that allow feeling optimistic about this initiative. In general terms, the main global external factors that may affect our project are nowadays creating a very favorable environment for our company to develop, and there is no prior reason to think they are going to evolve in another way.

Nevertheless, there are barriers that have to be overcome, mainly in the early stages and in the technological aspect, but on the other hand, there is no opposition to enter this market in Spain from competitors on the aeronautical RFID sector.

7.3 Microenvironmental Analysis

Porters Five Forces

The five forces framework is a tool to identify the sources of competition in an industry, and hence to assess the attractiveness (profit potential) of that industry. From the model it can also be determined in which ways individual organizations are likely to compete. The framework consists of the five forces shown in Figure 7.2.

Figure 7.2: Porter´s Five Forces

The industry is attractive to enter if these forces are weak. These competitive forces are driven by underlying forces in the macro-environment. These underlying forces are presented in the SLEPT-analysis presented in previous section. The competitive strategy performed by an incumbent player should attenuate these competitive forces. Furthermore, the model is useful for embracing all different factors influencing organizations competitiveness and to prevent the common mistake of focusing too much on direct competitive rivals.

7.3.1 The threat of new entrants

The threat of entry depends on the barriers that obstruct organizations when these ones try to enter the market. In order to compete successfully, new entrants must overcome those barriers. Below these lines, potential barriers to enter in RFID market in the aeronautical sector are detailed:

- **Economies of scale:** Economies of scale are not crucial, which makes easier the entry into the market. AIRFID starts focusing only on aeronautical companies, where every project will be different. Moreover,

our projects will be turnkey projects using milestones as a way of payments.

- **Initial investments:** A certain amount of capital for initial investments is required, but huge amount of money will not be needed. This amount is worth 100.000 , as we can see in the Legal Plan of Chapter 12, so funds must not be a problem to create the company and start the activity. This will be an important feature to enter in this market.

- **Access to supply and distribution channels:** This is an important fact to be considered. We have an important knowledge in the aeronautical sector (companies, ways to work) which facilitates the entry into the market.

- **Experience:** Some competitors have come further on their experience curve but not in this sector in which all the companies begin with the same opportunities.

- **Limited number of competitors in the country:** This is a new business area with a limited number of competitors, they are only abroad. Even if existing competitors in other sectors have not gained a certain amount of loyalty, there are still many suppliers and customers available. This makes the market easier to enter.

- **Possibilities of differentiation:** There are many opportunities for a new entrance to differentiate in the RFID sector. For instance, types of services, types of contracts, types of customers, regional differentiation etc. This makes it easier to enter in the market.

- **New technology:** The use of a new technology always involves a rejection some of the potential clients, but once the benefits of this edge technology are known, it will be extended throughout the aeronautical industry.

The conclusion is that the force representing the threat of entry is strong. This means that it is easy to enter in the market. At the beginning, this is good for our project. But once our company has settled down, it will not be that good because other competitors can easily follow us. Hence, the first crucial obstacle to overcome is to obtain the first contract without previous experience, and another obstacle is that competitors from other sectors may try to specialize and enter in the aeronautical sector.

When our company is settled in the market, the competitive strategy must aim to reinforce these barriers. For instance, AIRFID will need to build up a base of loyal customers and suppliers. This should be enhanced by long-term contracts. Another appropriate action is to apply different marketing efforts when a new competitor is entering.

7.3.2 The threat of substitutes

Substitution reduces demand for a particular kind of products or services as customers switch to the alternatives. This happens if the substitute has a higher perceived benefit or value for the customer than our product.

RFID technology arises due to an increasing interest towards an increase of productivity and efficiency. In other words, it reduces costs and time. It is by itself a substitute for the old way of stocking and controlling the pieces. From our point of view, there is not a short-term substitute for RFID technology. The barcode is an old technology with several disadvantages as it can be observed in Table 5.7 in the page 60. This fact makes the RFID market very attractive.

A new technology has been developed in the last months, which is called Bokodes. It is a kind of barcode but can hold thousands of times more information than bar codes and can be read by a standard mobile phone camera. Bokodes could replace RFID systems in some near-field communication applications but not in the aeronautical industry.

7.3.3 The purchaser's negotiating power

The buyer's bargaining power is very high in these kind of industries.Furthermore, we have to take into account that in general customers have a lot of power so it will be difficult to negociate with them. As a result of the heavy investment and the extended billing trend in the aeronautic industry, we will be paid through milestones.

If the purchaser's forces are strong, our strategic freedom will be constrained and the margins could likely be affected.

- **Big clients:** A buyer like Airbus Military, with several factories and a huge volume of parts and equipment, has a significant bargaining power.
- **Loss of clients:** The costs of choosing one or another company is relatively low before signing the contract, but once it is signed, their bargaining power decreases. Therefore, buyers have a high power before signing the contract.
- **Integration needed:** The need to integrate the RFID system with their current ERP system makes lower the bargaining power.
- **Quality:** The quality and reliability required by buying companies suits very well with our product offered. Therefore, it reduces the bargaining power of buyers.

- **Cost-cutting trend:** The real need of the aeronautic companies to change the current technology to reduce costs. It makes their bargaining power decrease.

The conclusion after these conditions is that the force representing the power of buyers is relatively weak. The main reason for this is their necessity to reduce cost by introducing RFID technology. There are few purchasing companies, but up to now no organizations are entering the sector with these kinds of services, which explains why aeronautical industry is so attractive.

7.3.4 The supplier's negociating power

The supplier's bargaining power is very low for this type of technology due to the high number of them. Therefore, this force has less effect in our organization as we compare with the power of the buyers. Our margins depend on them and not our survival as a company.

If the following forces are strong, the strategic freedom will be constrained and the margins are likely to be affected.s

- **Amount of suppliers:** Many suppliers, which makes them have low importance.
- **Volume of products bought:**We will manage a high volume of tags, readers and equipment in order to reduce their bargaining power.
- **Change of provider:** The costs of choosing one or another company providing us is relatively low, even to use more than one. Low negotiation power for providers.
- **Suppliers becoming Competitors**: The problem is that suppliers can become competitors and they can enter in our market. This could be a risk that must be taken into account as they can have better margins.
- **Quality:**The quality and reliability we require is high therefore they must offer us the product that we need. That makes their bargaining power increase.

The conclusion after these conditions is that the force representing the power of suppliers is relatively weak since there are a lot of suppliers, wholesalers and manufacturers.

7.3.5 Competitive rivalry

The four competitive forces presented above will influence the direct competitive rivalry within the industry. This occurs when one or more competi-

tors feel pressured or note an opportunity for improvement. Some factors on which the degree of competitive rivalry in this industry depends are discussed below:

- **Size of competitors:** The competitors are roughly equal size, but international holdings like IBM are already targeting RFID solutions. However, the number of competitors with the enough knowledge is low, meaning that the competition is not very strong.
- **Growth strategy:** The organizations in RFID industry can expect to achieve their growth through the activities diversification. Therefore, this sector would be interesting for competitors.
- **Low financing needs:** Fixed costs are low and after the first contract that we expect with Airbus Military or with another big company in the sector, the extra capacity can be added successively (and not necessarily in large increments as in some other industries). This means that an eventual over-capacity in the industry should not slice too much the margins as the costs can be adjusted.
- **Expansion of the technology:** As the RFID technology is developing, it is likely that more companies will know the possibilities and uses and will differentiate one with each other. Other important fact is that other aeronautical companies will follow the Airbus Military's footsteps. This may imply less intensive competition as they might use the same providers.

The conclusion is that the competitive rivalry is not very hard. The reason is that it is a increasing market specially in aeronautical industry with relatively few competitors. This makes the aeronautical industry very attractive.

7.3.6 Conclusions

The overall conclusion can be obtained from the five forces analysis. The conclusion is that RFID technology in the aeronautical sector is an attractive business. The main reasons can be summarized as that there is a huge and growing market with few competitors and no substitutes.

In addition to this, it is easy to enter the market. Initially, this is a big advantage for us. Once we have settled down ourselves in the market, we must try to reinforce the barriers to entry in order to protect ourselves from other competitors.

One risk could be that the demand for this kind of service does not increase as we expect. However we foresee strong trends to be more efficient every day and the necessity of reducing the cost in logistics, stocking and manufacturing.

7.4 Competitors and Suppliers Analysis

In this section we analyze the market demand, the main competitors and suppliers, the entry barriers into the market, etc. This analysis in combination with de Marketing Analysis that will be made in the Chapter 9 is a previous stage to set the strategic objectives.

There is no doubt that nowadays a huge market is currently emerging from the potential applications and services that will be offered using RFID technology.The number of RFID in service has increased rapidly in the last years, so the number of companies that are using this technology has gone up as well. Currently, the RFID market is still small, being nowadays the most proper moment to introduce this technology in the aviation industry before this technology will be a must in all production processes and logistics. This makes that there are relatively few companies involved in RFID in Spain and even less specialized in aeronautics, even when the sector has high prospects of growth.

We must distinguish in the RFID industry between suppliers and competitors. Sometimes this distinction is not clear because more and more suppliers are designing and installing the RFID components. These kinds of companies can be more competitive, because they start with the advantage of having incomes that may allow the initial investment in R&D.

Within competitors, we can mention two kinds. New companies in the RFID technology and companies specialized in barcodes. The second group has an important aspect of competition. Currently they are positioned in the field of barcode identification and having the knowledge in tracking and the target market for RFID. This gives them a major advantage of customer knowledge. The remaining companies are either newly created or worked with electronic equipment in other sectors, which could enable them to apply their knowledge and/or equipment through direct sales of hardware. Most of these companies are subsidiaries of foreign companies in Spain and are of relatively recent installation.

Geographically we have the advantage that the vast majority of enterprises are located in Madrid and Barcelona or are international companies being very small number of companies located in Andalusia.

Analyzing competitors can make a clear division according to their activity in the sector: On the one hand, companies which distribute the equipment develop software and install the "turnkey" system for the customer, while on the other hand, there are other companies whose strategy is to be mere distributors of equipment to third parties not involved in the final implementation.

As our business objective is the implementation of RFID systems, it is necessary to buy equipment directly from manufacturers or distributors. First of all, we should analyze which services are going to be demanded. We

need to calculate the potential market and the accessible market that we can reach. This market research can be consulted in Chapter 9.3. This combined with the increase in the RFID markets that can be consulted in the table makes very interesting the application of RFID in the aeronautical sector.

7.4.1 Competitors

Our business idea is pioneer in Spain. Nowadays we do not have competitors offering the same services and solutions that AIRFID. Indeed there are companies that offer similar services but in other sectors so using RFID in the aeronautical sector allows us to have the chance to reach an enormous sector, offering solutions for tracking tools, jigs, parts and instruments. The main competitors that offer RFID solutions are listed in Table 7.1[30].

N	Company	Location	Income	Year
1	ATOS ORIGIN	MADRID	326,569	2007
2	MOSTOLES INDUSTRIAL	MADRID	239,978	2007
3	AT4 WIRELESS	MALAGA	31,546	2007
4	GERMARK	BARCELONA	13,855	2002
5	MAIN MEMORY	BARCELONA	13,146	2007
6	ZETES MULTICOM	MADRID	11,885	2007
7	MEDICION Y CONTROL	BARCELONA	9,119	2007
8	AVERY DENNISON	BARCELONA	7,997	2007
9	DISTROMEL	MADRID	5,546	2007
10	JSV INFORMATICA	BARCELONA	5,030	2007
11	SATO IBERIA	BARCELONA	4,436	2008
12	ATHELIA SOLUTIONS	MADRID	4,096	2007
13	ICNITA	GIRONA	3,969	2007
14	ALIATIS	SEVILLA	3,580	2008
15	CLASE 10 SISTEMAS	PATERNA	3,005	2007
16	TREELOGIC	ASTURIAS	2,737	2007
17	ATOS ORIGIN PROM.	MADRID	2,365	2007
18	SISTEMAS INTERMEC	MADRID	1,696	2007
19	AIDA CENTRE	BARCELONA	1,243	2007
20	B.C. BIOCON INTERN.	GIJON	1,239	2007
21	TAG ESTATE ASSETS	VALENCIA	999	2007
22	LIBERA NETWORKS	MALAGA	851	2007
23	SAIDENT	BARCELONA	317	2007
24	E. PLANEAMIENTO ING.	MALAGA	126	2007
25	CITE TRADE TECH.	CASTELLON	46	2007

Table 7.1: Competitors RFID. Income expresed in K€

Once our business becomes known, for instance reaching one contract with Airbus Military or other important company in the sector, we take the risk of having new competitors that copy our business idea and can specialized their

services in the aeronautical sector. As we are pioneers in this sector, we have to take advantage over possible competitors by obtaining a good positioning and big market share due to our deep knowledge of the aeronautic sector.

Besides, as we are the first company in offering these services to the aeronautical sector, we will always be the most experienced ones and should be seen as a reference for our competitors. We must take into account this possibility in our strategic objectives, in the marketing plan and obviously in our price policy.

In order to show how big our competitors are two tables have been built. Figure 7.3 shows the biggest companies in terms of sales, although these companies are not only focused in the RFID technology. More specifically these companies are also dedicated to others technological activities like information technologies.

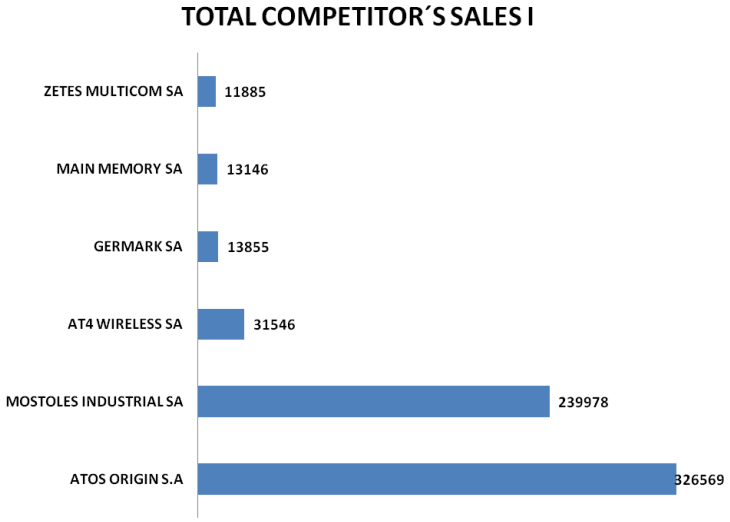

Figure 7.3: Competitor's Sales: Big companies

Logically their sales volume is going to be higher than the one of the small and medium competitors shown in Figure 7.4, where the majority of companies listed are RFID companies.

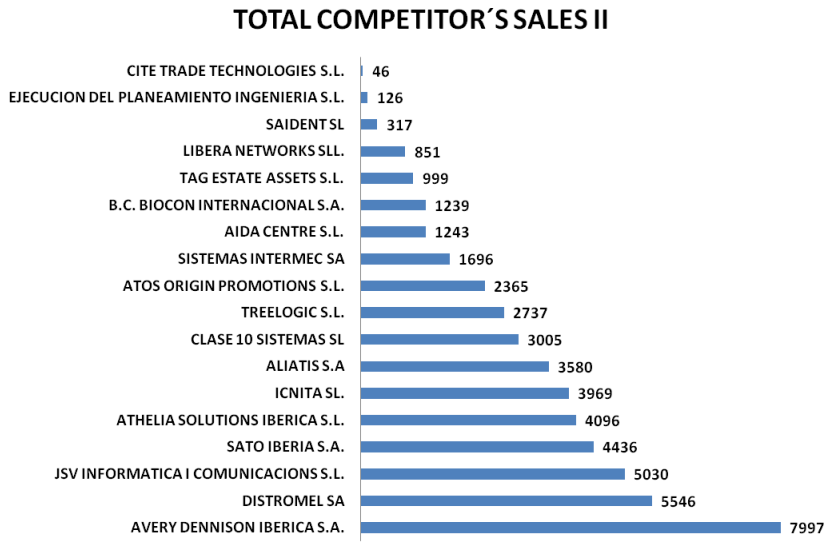

Figure 7.4: Competitor's Sales: Small and medium companies

As it can seen in Figure 7.5 most of our competitors are established outside Andalusia.

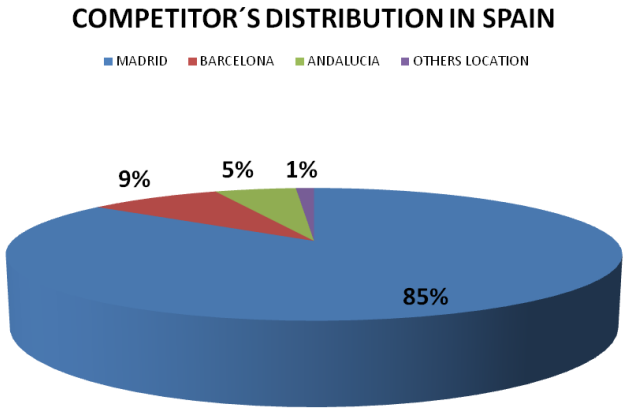

Figure 7.5: Competitors´ Distribution

7.4.2 Suppliers

As we are offering RFID solutions, we need to contact with suppliers that provide us the technology in order to fulfill the requirements of our customers. In order to do so, we should operate with concrete RFID devices.

In Table 7.2 a list of main suppliers is shown.

N	COMPANY	LOCATION	INCOME (K€)	YEAR
1	DIODE SPAIN	MADRID	171692	2007
2	TOSHIBA SYSTEMS	MADRID	48604	2007
3	INTERMEC TECH.	MADRID	27041	2004
4	MACSA ID	BARCELONA	16373	2007
5	AKROCARD 2000	BARCELONA	1722	2007
6	SUGRAGI SUM. GRAF.	BILBAO	289	2007
7	OSES RFID	NAVARRA	136	2007
8	CODERCO	BARCELONA	98	2005
9	PJM RFID IBERICA	BARCELONA	9	2006

Table 7.2: RFID Suppliers

In order to classify the suppliers in size and location that can offer us all kind of equipment Figure 7.6 has been built.

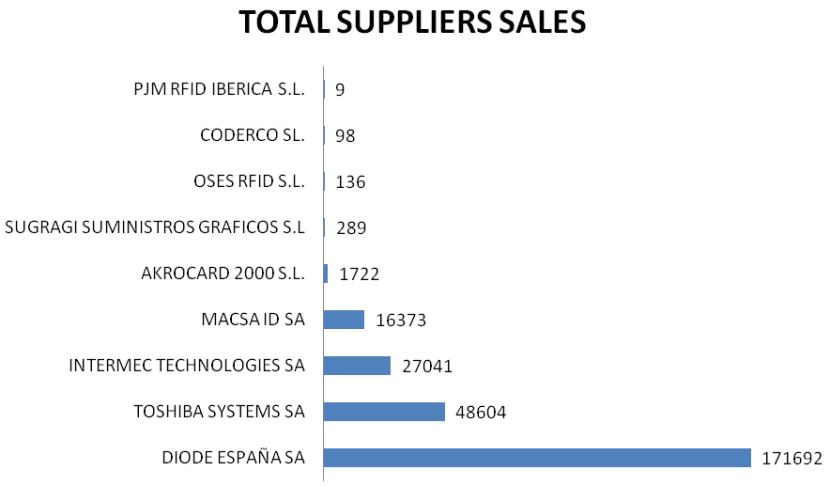

Figure 7.6: Suppliers´ Sales

Chapter 8

SWOT Analysis

This chapter uses the internal and external environments described in the previous sections in order to weigh them in relation with each other. By doing so, the proposed organization can have a precise guideline about the main strategic lines to follow in the future to accomplish its objectives and to overcome or minimize the obstacles that it may find.

8.1 Definition of the SWOT Analysis

The SWOT Analysis is a strategic tool that identifies the Strengths, Weaknesses, Opportunities and Threats of an organization in order to analyze its current situation. The main objective is to maximize the Strengths of a certain organization in order to:

- Take advantage of the Opportunities.
- Block the Threats.
- Reduce the Weaknesses.

The Threats and Opportunities are found in the external analysis of the organization. Therefore, it is essential to analyze the following entities:

- Main competitors and position of the organization among them.
- Market tendencies.
- Impact of globalization: international competitors entering the market. Imports and Exports.
- Other factors affecting the sector: macroeconomic, social, governmental, legal and technological.

The Threats and Weaknesses are detected as a result of an internal analysis of the organization, where the following parameters must be assessed:

- Quality and quantity of the resources of the company.
- Efficiency and innovation in the main actions and proceedings.
- Capability to satisfy the client.

8.2 Selection of the input arguments of the SWOT Analysis

The described steps have already been followed in the internal and external analysis of the previous chapters. Therefore, the Strengths, Weaknesses, Opportunities and Threats are already detected and are furtherly explained in this section.

8.2.1 Strengths

The main factors that most significantly increase the chances of success of the organization are the following:

- **Knowledge of the sector:** The members of the company have worked in different areas in such an important company in the Andalusian aerospace sector as Airbus Military. They have a broad view of different departments such as Quality, Subcontracting, Systems, Procedures and Cost Accounting. Moreover, they already have contacts in different companies in the sector where they can introduce their products.
- **High technical skills:**The five partners are engineers, 2 of whom are specialized in Telecommunications, 2 others in Electronics and another in Materials. Therefore, their academic profile is perfectly adapted to deal with a RFID implementation, where it is of capital importance to know how to handle with software and hardware. Moreover, the knowledge about materials can give us a competitive advantage in the study and development of new types of RFID tags.
- **Flexibility in the applications:** The company will offer different packages to their potential clients, so that they can combine them to fulfill their requirements. In case some customization is needed, the company is prepared to react quickly due to its flexible structure and its motivation to obtain new clients.

- **Small financing needs:** Within the first months of the company, few investments are expected apart from a couple of testing hardware models. The major part of the workload is done by the partners of the company, who will start earning the minimum wage.

  Once the company has signed contracts, payments are expected to be based on milestones, which is a very extended trend in the sector. Therefore, there won't be necessary to invest a big amount of money in the equipment that is installed in the client's facilities, as it will pay in the moment a milestone is completed. In the worst case, a certain investment will be needed but its payment will not be received in less than 2 or 3 months, which can also be the payment period of AIRFID to the providers.

8.2.2 Weaknesses

The main factors that need to be improved in the internal organization of the company are the following:

- **No work experience in the RFID sector:** Even though the members of the company are already familiar with the RFID technology, this is their first commercial experience with RFID. This will mean that they will need to pay special attention when negotiating with the hardware providers and they have to make an special effort to get to know its market when purchasing.

- **Limited capacity in the first steps:** The initial structure of AIRFID S.L. is thought for a gradual acquisition of contracts, and it is possible that an excessive initial workload will make AIRFID face difficulties to accomplish the delivery dates.

- **Lack of developed products:** In the initial moment, no catalogue is available to be shown to the potential clients. Therefore, the first months are dedicated to implement the different modules, so no sales are expected in this period of time.

- **High cost of implantation:** Even though an asset- tracking system has a low Return on Investment Period, it has a high initial cost that may be an important barrier when finding new clients.

8.2.3 Opportunities

The external factors of which AIRFID can take advantage are described in the list below:

- **High need of tracking in the aeronautic sector:** The aeronautic sector is gaining complexity in terms of number of tools, jigs and testing devices used. Their appropiate calibration and tracking is essential to increase the profitability of the company, as well as to make a correct use of the inventory.
- **Current cost-cutting trend:** Increasing the prices is not a realistic option when trying to increase the profitability of an aeronautic company given the high competitiveness of the market. Hence, operating costs must be cut, which is currently the most popular policy in the industrial companies. RFID can be really helpful for this purpose, as it can increase the productivity by a more efficient use of the workforce, or it may make possible to decrease the personnel in charge of inventory management or maintenance. Moreover, purchases may also decrease as assets will be more easily detectable and their approximate location will be stored.
- **Many hardware providers:** AIRFID can take advantage of the fact that RFID is already extended in other industrial areas, as currently there is a large amount of hardware providers. This can strengthen the negotiation power with providers and this will make the purchases much cheaper.
- **Possibility to reach the whole supply chain:** The first objective of AIRFID is to introduce into the aerospace industry by providing an asset tracking system. However, once several companies from the supply chain use RFID technology internally, it is interesting to offer them support by means of an integrated platform to enable them to track their different orders and deliveries all over the supply chain. This would be a really attractive and profitable service that could easily spread geographically among the different companies of the sector.

8.2.4 Threats

The external factors that can affect negatively the performance of AIRFID are the following:

- **Difficulty to reach the main potential client:** even before the marketing plan, it seems clear that the main company in the Andalusian aeronautic sector is Airbus Military. Even though it is a fact that they require an efficient tracking system, a new organization like AIRFID may find difficulties to sell its products to such a big client. The

commercial department will need to take special care in the process of needs detection in order to be able to offer an attractive product that could compete with the other companies that may aim the same target, or even with the companies that may be working with Airbus.

- **Huge RFID companies interested in the sector:** As mentioned in chapter 4, giant companies such as IBM and Nokia are already entering the market , and many other RFID companies that have successfully worked in other industries will be interested in exploiting such an attractive sector. Therefore, it is important to be among the first companies to sign contracts in the Andalusian sector, if not the first one.

- **Current crisis situation- clients might need financing:** As the initial investment is high, many clients may need financing help to be able to face such a heavy investment. This could be obtained by means of a public subvention or zero-interest loan, which is quite common for this kind of companies, but the current crisis may stop some companies even from thinking about it. However, if AIRFID manages to obtain some contracts it may soon be able to offer attractive payment periods.

- **Reluctance to implement new technologies:** Some companies may be reluctant to such an important asset-tracking system change because they may think they won't be able to learn how to use it so that they could take advantage from it. This threat is bound to be a problem for traditional companies of the Andalusian aeronautic sector.

8.3 SWOT analysis with the axes obtained

In this section, the obtained factors will be related one with each other so that the main Strengths, Weaknesses, Opportunities and Threats are detected. As a result of this, false strengths or weaknesses may appear (so a new factors redefinition will be needed), and it may be found that the current situation of AIRFID doesn't let it take advantage from an opportunity or that a certain threat is blocked by the strengths.

The figure below shows the matrix that relates all of the described factors. Each of the relations are marked by a number between -3 and 3 (3 means a very positive impact on the company and -3 means a very negative impact). In order to make it clearer, the given relations are marked answering the following questions for each relationship:

- **Strengths-Opportunities:** A certain strength makes possible to take advantage of an opportunity?
- **Strengths-Threats:** A certain strength helps to block a threat?
- **Weaknesses-Opportunities:** A certain weakness stops the company from taking advantage of an opportunity?
- **Weaknesses-Threats:** A certain weakness exposes the company to a threat?

This is the matrix where all these answers are shown:

		Opportunities				Threats				
		High need of tracking in the sector	Current cost-cutting trend	Many hardware providers	Possibility to reach the whole supply chain	Difficult to reach the main potential client	Huge RFID companies interested in the sector	Current crisis situation, clients might need financing	Reluctance to implement new technologies	
Strengths	Knowledge of the sector	3	2	0	3	3	2	1	1	15
	High technical skills	2	3	2	3	2	1	0	0	13
	Flexibility in the applications	3	2	1	3	1	2	1	1	14
	Small financing needs	3	1	0	1	1	1	3	1	11
Weaknesses	No experience	-2	0	-1	-2	-3	-2	0	0	-10
	Limited capacity in the first steps	-1	0	0	0	-2	-2	0	0	-5
	No developed products	-2	-2	0	-2	-3	-2	-1	-2	-14
	High cost of implantation	-1	-2	1	-1	-1	-1	-3	-2	-10
		5	4	3	5	-2	-1	1	-1	28

Figure 8.1: SWOT analysis

8.4 Results of the SWOT analysis

The previous section offers a clear view of AIRFID's situation given the existing environment and current internal situation of the company. The described analysis must be read from each of the 4 axes:

- **Strengths:** The main strength detected is the knowledge of the sector. It seems that this feature can provide AIRFID some competitive advantage over the other competitors, as the companies from the aeronautic sector will probably be more confident when they deal with somebody aware of their needs and their way of working. Secondly, the flexibility in the designed modules is another advantage of AIRFID, as it can offer customized applications to suit customer's needs. This strength is obviously linked to the existing high technical skills.

- **Weaknesses:** The lack of developed products can be the main difficulty for AIRFID in the first months of business activity. This would mean that no sales will be made until a small portfolio of the different products offered is available to be shown. Apart from this, the high cost of implantation of the RFID solutions can imply that some companies may be reluctant to invest a large amount of money if the return of investment is not clear or attractive enough.

- **Opportunities:** Among the opportunities, the one that is mostly strengthened by the internal capabilities of AIRFID is the high need of tracking in the sector. This company can make profit from this need by applying all of the detected advantages. Regarding the weaknesses, they also need to be taken into consideration but they don't block any of the opportunities. Another important long -term opportunity is the possibility to reach the whole supply chain if AIRFID manages to introduce its products in several companies of the supply chain. For this purpose it is important to reach the important players in the local aeronautic sector.

- **Threats:** The most important threat is apparently the difficulty to reach the main potential client, which as mentioned would be really helpful to introduce the company in the market in a visual and efficient way. However, the knowledge of the sector and high technical skills can be helpful to obtain an interesting contract in this company or even in another important one. If so, working with large suppliers and subcontractors can also be an interesting way of entering this company and gaining a considerable market share. Another interesting output of the SWOT analysis can be that the current crisis situation can be minimized by the fact that AIRFID has relatively low financing needs (therefore some financing capability), and that the high technical nature of RFID can lead to some external financiation in terms of subsidies of low interest loans from the Regional Administration.

Chapter 9

Marketing Plan

9.1 Introduction

What does the term marketing mean? Marketing must be understood not in the old sense of making a sale - 'selling' - but in the new sense of satisfying customer needs. Many people think of marketing only as selling and advertising. And no wonder, for every day we are bombarded with television commercials, newspaper ads, direct mail and sales calls.

This does not mean that selling and advertising are unimportant. Rather, it means that they are part of a larger marketing mix - a set of marketing tools that work together to affect the marketplace. We define marketing as: a nodal and managerial process by which individuals and groups obtain what they need and want through creating and exchanging products and value with others:" To explain this definition, we examine the following important terms: needs, -wants and demands products; value and satisfaction; exchange, transactions and relationships; and markets.

People satisfy their needs and wants with products. A product is anything that can he offered to a market to satisfy a need or want. Usually, the word product suggests a physical object, such as a car, a television set or a bar of soap. However, the concept of product is not limited to physical objects - anything capable of satisfying a need can be called a product. In addition to tangible goods, products include services, which are activities or benefits offered for sale that are essentially intangible and do not result in the ownership of anything.

Consumers usually face a broad array of products and services that might satisfy a given need. How do they choose among these many products? Consumers make buying choices based on their perceptions of the value that various products deliver.

The guiding concept is customer value. Customer value is the difference between the values the customer gains from owning and using a product and

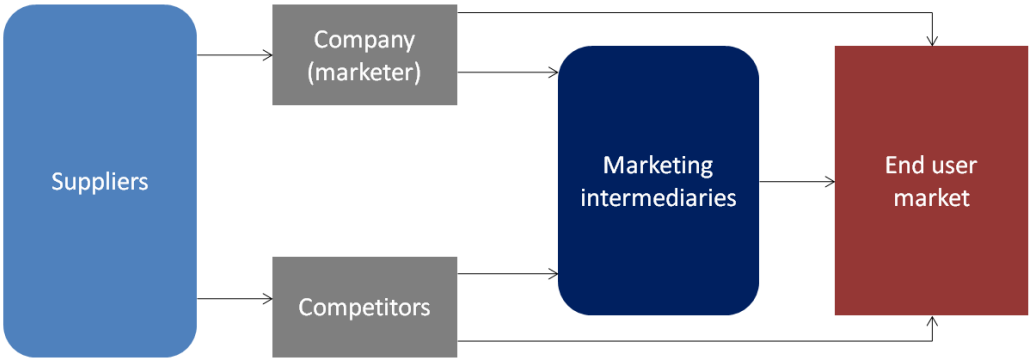

Figure 9.1: Main actors and forces in a modern marketing system

the costs of obtaining the product.

The concept of markets finally brings us full circle to the concept of marketing. Marketing means [31] managing markets to bring about exchanges for the purpose of satisfying human needs and wants. Thus, we return to our definition of marketing as a process by which individuals and groups obtain what they need and want by creating and exchanging products and value with others.

Exchange processes involve work. Sellers must search for buyers, identify their needs, design good products and services, promote them, and store and deliver them. Activities such as product development, research, communication, distribution, pricing and service are core marketing activities.

Although we normally think of marketing as being carried on by sellers, buyers also carry out marketing activities. Consumers do 'marketing' when they search for the goods they need at prices they can afford. Company purchasing agents do 'marketing' when they track down sellers and bargain for good terms. A sellers' market is one in which sellers have more power and buyers must be die more active 'marketers'. In a buyers' market, buyers have more power and sellers have to be more active 'marketers'.

Figure 9.1 shows the main elements in a modern marketing system. In the usual situation, marketing involves serving a market of end users in the face of competitors. The company and the competitors send their respective products and messages directly to consumers or through marketing intermediaries to the end users. All of the actors in the system are affected by major environmental forces - demographic, eeonomic, physical, technological, political/legal, social/ cultural.

Each party in the system adds value for the next level. Thus, a company's success depends not only on its own actions, but also on how well the entire value chain serves the needs of final consumers. IKEA cannot fulfil its promise of Low prices unless its suppliers provide merchandise at low costs. And Toyota cannot deliver high quality to car buyers unless its dealers provide

outstanding service.

9.2 Militar Transport Aircraft Forecast

Demand for transport aircraft is projected to remain stable until 2017. Air Forces around the world are looking to replace aging aircraft in their inventories, and the U.S. military continues to acquire several transport types as part of an ongoing recapitalization effort. Western Europe continues to be a major customer for transport aircraft and will begin receiving the Airbus Military A400M in large numbers starting in 2011.

Forecast International is projecting the production of 982 military transports worth approximately $71 billion during the 2010-2017 forecast period covered by this analysis. With some fluctuation, annual production values will rise from $6.2 billion in 2008 to a 10-year high of $10.0 billion in 2013 before gradually falling to $4.9 billion in 2017.

Production of heavy military transport aircraft is expected to account for 518 (53%) of the total 982 transport aircraft projected to be delivered during the forecast period. The value of this production will total $60.5 billion, or 85.3 percent of the value of military transport production overall.

Lockheed Martins C-130J will lead the heavy segment of the market and the market overall in terms of units produced, but the Airbus Military A400M and Boeing C-17 will each account for a greater share of the value of production. Together these three programs will account for more than 80 percent of the value of overall market production. Because of the C-130s lower unit cost, the value of production of the C-130 will be lower than that of the two larger aircraft.

Production of medium transports is projected to account for 355 aircraft during the next 10 years, or 36.2 percent of total unit production. The total value of production for this segment during the forecast period will amount to $9.9 billion, or 14.0 percent of the value of the military transport market overall.

The Alenia Aeronautica C-27J and Airbus Military C 295/CN-235 will be the major players in the medium transport market segment. Airbus Military will lead the segment based on projected production of 112 C-295s and 66 CN-235s (178 units combined) worth $4.8 billion. Alenia will follow on the heels of Airbus Military with production of 152 C-27s worth $4.6 billion. These three aircraft will account for 93 percent of unit production of the medium transport segment. Dirgantara Indonesia and Chinas Xian will also produce small numbers of turboprop aircraft for this segment.

In the light military transport segment, production is projected to total only 109 units worth $550.7 million, or 11.1 percent of the unit production of military transport aircraft overall. The value of this production will be

dwarfed by the value of production of the heavy and medium segments. This segment will be led by Airbus Military with production of its C 212.

The military transport market is less competitive than many other segments of the aviation market. The heavy, medium, and light segments each tend to be dominated by only one or two Western manufacturers. The potential entry into the heavy segment of the C-390 transport made by Brazilian aircraft manufacturer Embraer with an aircraft designed to compete directly with Lockheed Martins C-130 would increase the competition in that market.

Western manufacturers are now the major players in the worldwide military transport market and are making inroads on markets once dominated by Russia and Ukraine. Development of new transport aircraft to replace aging Soviet-era designs has been hampered by low military spending in those two nations. Russia and India are reported to be looking to work together on development of a new aircraft under the Multirole Transport Aircraft program, but whether this program will see progress during the forecast period remains a matter of speculation.

9.3 Regional Transport Aircraft Forecast

In the wake of the 2001 collapse in air traffic, many major airlines consolidated their route structures and parked large numbers of aircraft. For the most part, these carriers simply offloaded the routes to their regional airline partners. In those cases where routes were abandoned completely, regionals would still step in to fill the market void.

Once again, financial pressures are forcing the majors to undergo another round of capacity dumping and route consolidation. This time, though, they are not passing the work over to their regional allies. Instead, capacity reductions are even extending to capacity flown by regional partners, thus forcing a downsizing of the fleets of those regionals affected by such moves.

In the current airline industry environment, majors and regionals alike are feeling financial pressure. Rising fuel costs and slowing passenger traffic are combining to make the operational economics of even regional aircraft problematic. Particularly impacted are 50-seat regional jets, large numbers of which were delivered to regional airlines in recent years and remain in service.

Rather than causing regionals to expand into service areas abandoned by the majors, these market factors are forcing many regionals to themselves undergo consolidation. It is true that some regionals are suffering worse than others. But it is also true that, at least in the U.S., there is an excess of capacity at nearly all levels of the airline industry.

Nevertheless, opportunities do exist for regional aircraft manufacturers in this difficult market. Indeed, order rates for regional aircraft have been

rising since 2005. While many of those inefficient 50-seat regional jets will be grounded, a significant percentage will be replaced by larger-capacity aircraft. Indeed, in terms of seating capacity, regional jet demand has continued to shift upward from the once-dominant 50-seaters to 70 seat aircraft, and now to jets seating at least 90 passengers.

Most of the future growth in the regional aircraft market will be in the 90-125 passenger class, though scope clauses place a real limit on the growth potential of this portion of the market. Scope clauses are found in the contracts of major airline pilots, and limit the size of aircraft that regional partners of the major can operate. Eventually, financial pressures may force an easing of these clauses. In the meantime, 90-125 seat regional jets will find customers among regionals unaffected by scope clauses as well as among low-fare airlines and even major carriers.

Turboprop airliners are seeing a resurgence in demand, to the great benefit of ATR and Bombardier. These two companies stayed in the turboprop business while many others were dropping out.

Forecast Internationals [32] projections indicate that Embraer, Bombardier, and ATR will be the leaders in the regional aircraft market during the next 10 years. Combined, these three companies are expected to account for over 75 percent of unit production and over 80 percent of production value during the forecast period.

Forecast International projects [32] that a total of 4,066 regional aircraft will be produced from 2008 through 2017. The value of this production, as measured in constant 2008 U.S. dollars, is $116 billion.

9.4 Marketing plan scheme

All critical marketing elements involved in a product/service are integrated in the Marketing Plan [33]. This plan is an integral model that contributes to:

- Exploit customer needs in a segmented and prioritized way
- Develop value propositions that respond to the analyzed needs
- Concrete the value proposition in an integrated way in the four elements of the marketing mix

As a result, the Marketing Plan conceptual scheme is shown in figure 9.2 on page 100. First of all we need to understand the principal needs and behaviors of each kind of customer and their relative value. Furthermore, the definition of customer segmentation must be studied as well as quantified and their characteristics must be quantified. In the aeronautical sector, we

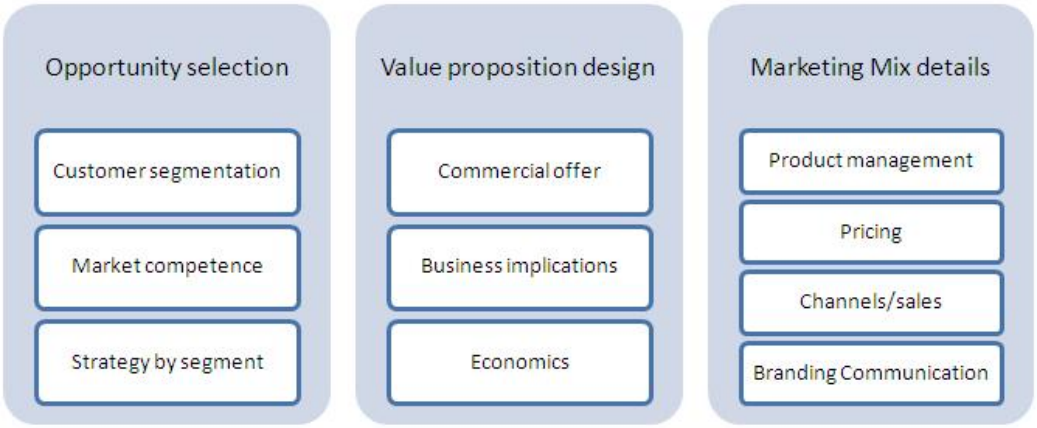

Figure 9.2: Marketing plan scheme

differentiate between the main airplanes manufacturers and the TIER 1 and 2 suppliers.

Afterwards we need to analyze the different segments in terms of our competitive fit: the valuation of the capacity of the company to compete in each market segment. Once the customer segmentation and the market competence have been analyzed, we will be able to define the strategy for the different segments.

The next point is to design the value proposition. It means to specify our offer for the target segment and detail the implications for the enterprise of the defined offer, in commercial and operative terms. Finally the marketing mix details must be applied. It identifies the products, decides the pricing, chooses the different channels and develops the branding strategy and the brand name selection.

9.5 Market research

We define marketing research as the systematic design, collection, analysis, and reporting of data and findings relevant to a specific marketing situation facing the company. A company can obtain marketing research in a number of ways. Most large companies have their own marketing research departments, which often play crucial roles within the organization.

Companies normally budget marketing research at 1 to 2 percent of company sales. A large percentage of that is spent on the services of outside firms. Marketing research firms fall into three categories:

1. **Syndicated-service research firms**: These firms gather consumer and trade information, which they sell for a fee. Examples: Nielsen Media Research, SAMI/Burke.

2. **Custom marketing research firms**: These firms are hired to carry out specific projects. They design the study and report the findings.

3. **Specialty-line marketing research firms**: These firms provide specialized research services. The best example is the field-service firm, which sells field interviewing services to other firms.

Small companies can hire the services of a marketing research firm or conduct research in creative and affordable ways, such as:

1. Engaging students or professors to design and carry out projects

2. Using the Internet: A company can collect considerable information at very little cost by examining competitors' Web sites, monitoring chat rooms, and accessing published data.

3. Checking out rivals: Many small companies routinely visit their competitors.

In our case, in order to get some relevant data, we have made contact with different institutions in Spain by Internet or by phone such as *Fundación Hélice, Madrid Plataforma Aeronáutica y del Espacio*, etc.

Effective marketing research involves the six steps shown in figure 9.3:

Step 1: Define the Problem, the Decision Alternatives, and the Research Objectives

Marketing management must be careful not to define the problem too broadly or too narrowly for the marketing researcher. In our case, the problem is to research the different aeronautic companies in Spain.

Step 2: Develop the Research Plan

The second stage of marketing research calls for developing the most efficient plan for gathering the needed information. The marketing manager needs to know the cost of the research plan before approving it. Designing a research plan calls for decisions on the data sources, research approaches, research instruments, sampling plan, and contact methods.

The researcher can gather *secondary data, primary data*, or both. Secondary data are data that were collected for another purpose and already exist somewhere. Primary data are data freshly gathered for a specific purpose or for a specific research project. In our project we have chosen *secondary data* provided by diferent associations.

Step 3: Collect the Information

The data collection phase of marketing research is generally the most expensive and the most prone to error. In the case of surveys, four major problems arise. Some respondents will not be at home and must be contacted again or replaced. Other respondents will refuse to cooperate. Still others will give biased or dishonest answers. Finally, some interviewers will be biased or dishonest. Getting the right respondents is critical.

However, as we have recollected most of the information by Internet and Phone, we haven't found many difficulties in this process.

Step 4: Analyze the Information and Step 5: Present the Findings

The next-to-last step in the process is to extract findings from the collected data. In the following sections are described our results.

Step 6: Make the Decision

The managers who commissioned the research need to weigh the evidence. If they are predisposed to launching the service, the findings support their inclination. They may even decide to study the issues further and do more research. The decision is theirs, but hopefully the research provided them with insight into the problem.

Once we have defined the different steps in a market research, let's start looking at the diferent aeronautic markets in Spain:

1. Madrid
2. Andalucía
3. Basque Aerospace Cluster
4. Aragón-Catalonia Cluster

9.5.1 Madrid

In order to get some information about the aeronautic sector in Madrid we have contacted with *Madrid Plataforma de la Aeronáutica y del Espacio*.They provided us a catalog of the aerospace sector in the Community of Madrid [34]. This brochure, prepared by *Dirección General de Innovación Tecnológica*, reflects the importance of the aerospace industry in the Community of Madrid and the role played by key institutions and aerospace companies in this region.

Madrid is the leading financial and services centre and the second largest industrial region in Spain. It has a high potential for scientific creation

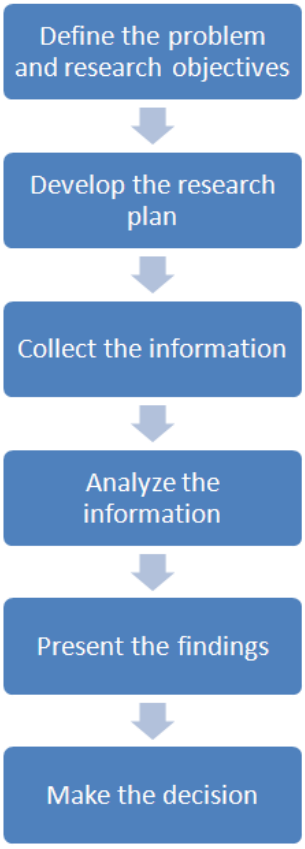

Figure 9.3: Marketing Research Process

and research thanks to the concentration of the largest supply of public scientific R&D resources in the entire national territory. It leads in allocation of resources to R&D activities in Spain, with a research intensity of 1.82% in terms of GDP.

Madrid is a leading region in technological development in general, and in the aerospace industry in particular. The current prestigious position held by the Madrilenian aerospace industry is not a fortuitous fact, but the result of constant scientific and technological effort in research, development and innovation.

The aerospace industry has a very prominent presence in Madrid, since it is the location for very important companies and institutions in this high technology sector. The Region of Madrid represents 60% of Spanish aerospace turnover. This percentage rises to 80% if the space sector is considered on its own. So it is no surprise that Madrid houses important companies in the sector, as well as outstanding national and international organisations connected with aeronautics and space.

The aeronautical industry in the Region of Madrid is very dynamic. Proof of this is the diverse projects in which it is actively participating, of which the following are the most notable:

- **Airbus A400M**: The Airbus A400M is the first military plane manufactured by the European construction company Airbus to replace the old fleets of military planes in air forces. This aircraft will have over double the useful load and volume of the planes it will replace and it will be equipped with cutting edge technology, such as the fly-by-wire flight control system, advanced structural design with extensive use of compound materials, high performance turboprops and high flotation landing gear, which enables operation from short unpaved runways, among other characteristics.

- **ARBS System**: The Air Refuelling Boom System (ARBS) is a rigid, telescopic boom, anchored in the tail cone of a tanker plane that enables a large volume of fuel to be transferred in a very short time to the receiving plane, incorporating the latest technology in this field. This entirely new boom system is a modern and complex system that has the advantage of offering the most recent technology available and the most modern solutions at the same time.

  The A330 MRTT can be equipped with a combination of hose and drogue on wings and/or fuselage and/or the Airbus Military in-flight advanced refuelling boom system (ARBS). There can be a boom operator and a mission planning station in the cockpit, which will include remote controls equipped with the enhanced 2D/3D vision system.

- **Airbus A350**: The A350 family is Airbus response to a market demand to have planes with a long range and average capacity, developing

a new wider fuselage to have extra space and offer more comfort to passengers. This aircraft family, available from 2012, will have a capacity between 250 and 375 passengers and a range of up to 15,800 km. A cargo version is also planned, the A350-900F. The A350 planes will be very efficient and silent and they will have a very low level of emissions.

- **Airbus A380**: The A380 is the commercial plane with the most passenger capacity built to date, since it is capable of transporting 555 people on board. It is the first airliner that has two real storeys and its passengers will be able to enjoy wider seats and aisles. The A380 has Airbus well-known fly-by-wire technology and it can be equipped with Trent 900 Rolls-Royce engines or GP7200 engines by The Engine Alliance (a Joint Venture between General Electric and Pratt & Whitney). It will weigh a maximum of 590 tons on take-off. The cargo version, A380 Freighter, will be able to transport 150 t of useful load.

- **Airbus Military CN-235**: These aircrafts cover a wide and varied range of maritime and national security surveillance missions: police surveillance, marine contamination control and surveillance of Exclusive Economic Zones (EEZ), search and rescue.

- **Eurofighter**: Eurofighter is an example of international cooperation between Germany, Spain, Italy and the United Kingdom. It is a fighter plane capable of performing multiple missions with ease and precision. This aircraft entered into service in the air forces of the four partner countries in spring 2004 and between these four countries they had ordered over 600 units. Other nations have also acquired this plane or they have shown an interest in it. The first Eurofighter for the Spanish air force made its first flight in February 2003, taking off from the Getafe facilities.

Sector Segmentation

As we have seen, the aeuronautic sector in Madrid is very important. Nevertheless we must take into consideration how this sector is segmentated. As we can see in figure 9.4, most of the companies' activities (75%) are manufacture and assembly, Engineering means 5% and Maintenace about 20%.

Representative companies of the aerospace sector in Madrid

ACATEC, S.L.

This is a manufacturer of aeronautical material and specialised in component manufacturing, surface treatments and assemblies. It takes part in projects of other companies such as Airbus (structural and hydraulic elements), Eurofighter (metallic avionics and hydraulic elements), Embraer (structural el-

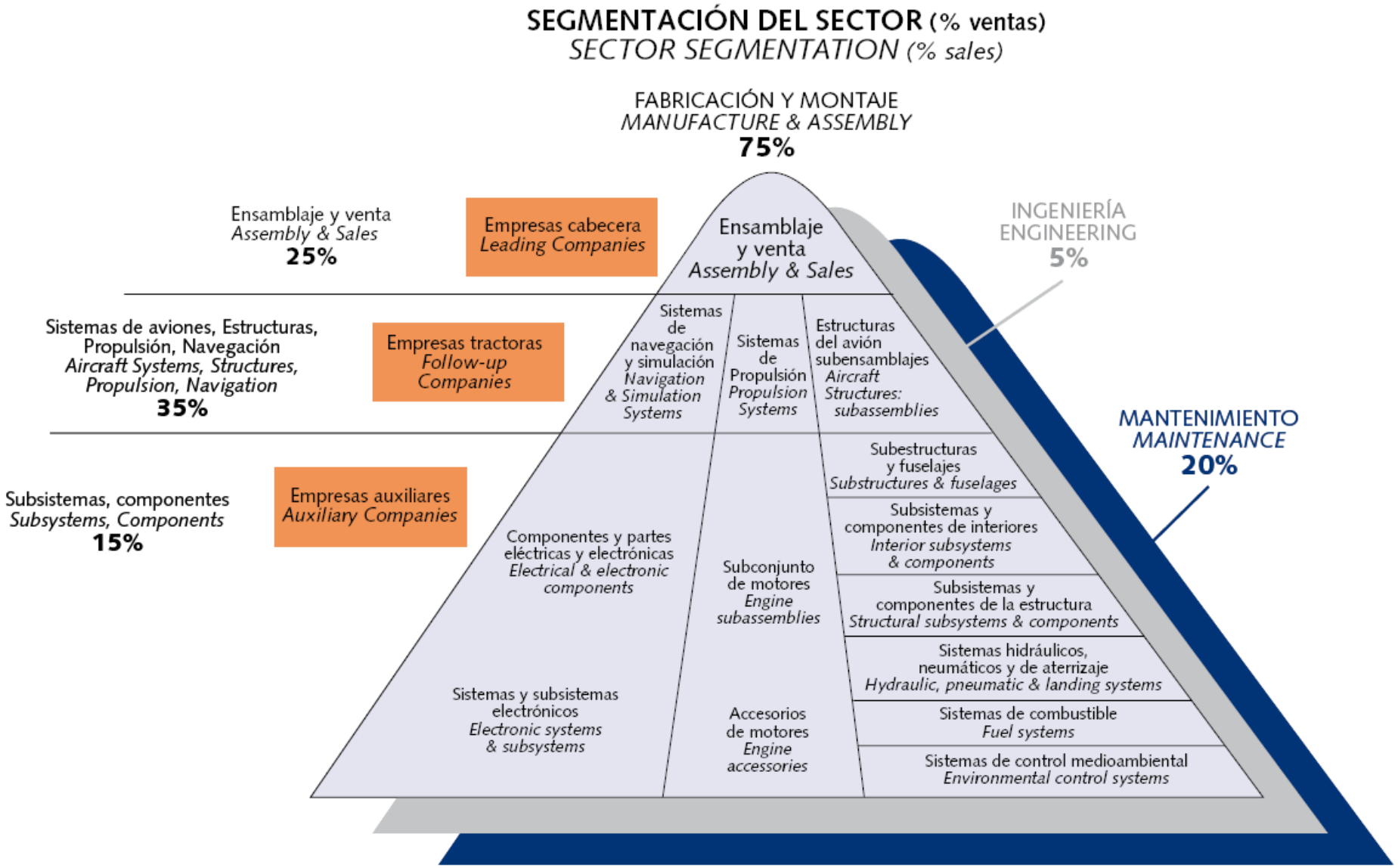

Figure 9.4: Madrid's sector segmentation

ements for Embraer 145 and 170) and Airbus Military (structural and hydraulic elements and trains of CN 235 and CN 295).

AERLYPER, S.A.

This is a pioneering avionics firm with more than 40 years of experience in the aeronautical sector. The company is specialised in the design and integration of Avionics and Optronics Systems in civil and military aircraft.

AERNNOVA ENGINEERING SOLUTIONS, S.A.

Aernnova, formerly Gamesa Aeronáutica (http://www.aernnova.com) is a supplier of aeronautical structures with the capability to take on full responsibility for the design, development, certification, manufacture and support of complete aircraft sections (located in the most complex parts such as wings, stabilizers, rear fuselages, etc.).

AERODISA, S.L.

Aerodisa is known for its R&D&I work in fields related to Aeronautical Engineering. It primarily has carried out studies in the fields of turbomachinery and UAV (Unmanned Aerial Vehicles) for training and surveillance.

AIRFASTER, S.L.

Airfaster, founded in 1993, provides supply and integral logistic services to the civil and military aeronautical sector. It is specialised in the supply and distribution of components, systems and equipment, as well as hazardous merchandise, chemical products and explosives.

AMPER PROGRAMAS DE ELECTRONICA Y COMUNICACIONES, S.A.

Amper Programas is the Amper Group firm that is specialised in communications and command, control and information systems and equipment. Its lines of business are: information and communication systems for the Armed Forces: avionics, integrated logistic support, and air navigation radio assistance systems.

ARGONGRA, S.L.U.

This is a consulting firm specialised in the management and analysis of geographical information, in relation to both the environment and to territorial analysis in general.

ARIES COMPLEX, S.A.

This is a company specialised in the manufacture of composite material components, and in particular structural components and interior aircraft panels. In this field it collaborates with AIRBUS and AIRBUS MILITARY and is certified according to Standard ISO 9001.

ARIES INGENIERIA Y SISTEMAS, S.A

This is a Spanish engineering firm specialised in the development of high-tech solutions. The Space and Defence division in Aries Ingeniería is specialised in turnkey projects in a range of technological areas: UAV systems, ballistics, underwater acoustics, testing systems, radar, etc.

BOEING RESEARCH & TECHNOLOGY EUROPE S.L.

Boeing has been working in Spain since the 1930s. In 2002 Boeing based the Boeing European Research and Technology Centre in Madrid. This is a centre of excellence in aeronautical technology that develops R&D projects in air traffic control, air safety and environmental technologies, and it is the first of its kind that Boeing has established outside the United States.

CADTECH INGENIEROS, S.L.

This is a company that markets information technologies and systems for the development, manufacture and management of product, process and service data, including their virtual simulation. It carries out product and equipment design activities in the field of aeronautical engineering.

CIMSA, INGENIERIA DE SISTEMAS, S.A.

This is a company specialised in the design and manufacture of parachutes and aerodynamic stabilizers. To conduct its business, CIMSA has developed a specific graphic design software and simulation tools to build distribution maps of air pressures and speeds on parachutes.

COMPANIA ESPANOLA DE SISTEMAS AERONAUTICOS, S.A.

CESA is a company that focuses on different activities in the field of aeronautics, e.g. equipment design, engineering, rating and certification, and maintenance, repairs and overhaul, etc. Its specialty is the manufacture of fluid mechanical equipment, such as: landing gear, hydraulic systems and flight control.

DEIMOS SPACE, S.L.

The solutions proposed by DEIMOS Space include a wide range of specialised aerospace engineering studies and software developments in the areas of: Mission Systems and Data, Advanced Projects, Mission Operation Systems, Real-Time Systems, Space Software Systems, Technology Transfer.

EADS ASTRIUM CRISA

Founded in 1985, Crisa has participated in most of the leading European space programmes, with more than 200 projects completed to date. Crisa is currently integrated into Astrium, S.L. It has played a very relevant role in most of the scientific and Earth observation missions of the ESA. Its experience in the space sector covers all kinds of applications, such as Earth observation, space infrastructure, scientific programmes, and telecommunications and navigation.

ESPELSA, ESPECIALIDADES ELÉCTRICAS, S.A.

ESPELSA, through its Telecommunication and Control Systems division, is specialised in the Engineering, Design and Integration of Advanced Computing Systems, Command-Control Systems, and Advanced Real-Time Training and Control Systems.

EUROCOPTER ESPANA, S.A.

Created in 1992, the French-German-Spanish Group Eurocopter is a Division of EADS, a world leader in the aerospace and defence industry and related services. Eurocopter is currently one of the worldwide references in rotary-wing aircraft manufacturing.

EUROPAVIA ESPANA, S.A.

This is a company created for the marketing and distribution in Spain of high-tech equipment, with one of the customer bases being the aeronautical sector.

FMC AIRLINE EQUIPMENT EUROPE, S.L.

FMC, which is located in Alcalá, is the Spanish Airport Equipment Division of the U.S. multinational FMC, a world leader in pallet loading platforms for airports. FMC Alcalá also supplies other airport equipment, such as passenger steps, container platforms and pallet transporters, to the major airlines and handling companies around the world.

GMV AEROSPACE AND DEFENCE S.A.

GMV is a technological corporate group that offers its solutions, services and products in numerous sectors, including the aeronautical and space sectors. GMV works for large manufacturers in the aerospace sector and other entities (AENA and Eurocontrol) as a specialist in engineering, software development and aeronautical systems.

GRUPO AERONAUTICO ZONA CENTRO, S.L.

The core business of G.A.Z.C., formed by the companies Talleres Pibab, Anonizados Herrero, San José Villa, Utillaje Huertas and Martos JJN, S.L., is conventional machining of different parts and components, as well as the finishing of some of these parts. Its main customer is Airbus Military.

GRUPO TAM

Tam began its professional activity in the 1950s in the field of machining and spare parts for the automobile industry. Since the 1980s, the company has specialised in cutting-edge numerical control technology for the aerospace industry. At present, its core business focuses on engineering-related activities such as manufacturing, metrology, assembly, maintenance and logistic support.

HEXCEL COMPOSITES, S.A.

Hexcel Composites is one of the worldwide leaders in composite material manufacturing for the aerospace sector, with a production plant located in

Parla (Madrid). The aircraft families Airbus A320, A330, A340 and A380 employ Hexcel carbon fibres in different components, such as the tail unit. Hexcel has also participated with General Electric and Snecma in projects for the manufacture of gas turbine fan blades made with composite materials.

HISDESAT Servicios Estratégicos S.A.

HISDESAT was founded in 2001 to provide space system-based services. HISPASAT, INSA, Airbus Military, Indra and Sener all hold shares in the company. It is specialised in the acquisition, operation and marketing of satellite capacities, in order to provide strategic and communication services for both civil and military applications.

HISPASAT, S.A.

Hispasat is a satellite operator founded in 1989 which aims to be the reference operator for the Spanish and Portuguese speaking markets. Hispasat currently provides coverage and services in Europe, America and North Africa. Hispasat has communication satellites located in three orbital positions: a 30 west transatlantic position, where satellites Hispasat 1B, Hispasat 1C and Hispasat 1D are located; an American position, 61 west, where the Amazonas satellite is located; and an eastern position, 29 east, corresponding to the Xtar-Eur satellite.

IBERICA DEL ESPACIO, S.A.

IberEspacio is a company in which SNECMA MOTEURS (a French Public Enterprise and world leader in aeronautical and space propulsion) and EMPRESARIOS AGRUPADOS (Association of energy sector engineering firms, leader in Spain) hold the controlling shares. It is specialised in engineering and supply management services for the aeronautical and space sectors (civil and defence).

IBERIA MANTENIMIENTO

The Iberia Group is one of the leading airlines in the world. The Maintenance Division of Iberia is responsible for the maintenance and repair of the airplanes, engines and components of the company and another fifty airlines. This Division has a staff of more than 4,000 employees, and its facilities in the Madrid- Barajas airport occupy a surface area of almost 2.5 million square metres.

INDRA ESPACIO S.A.

Indra Espacio is a subsidiary company of Indra and Alcatel Space responsible for activities connected with the space sector. It performs activities for the sector in the field of system design, development, integration and tests.

INDRA SISTEMAS, S.A.

Indra Sistemas is a leading Spanish company in the information technology and defence system markets whose business is divided into three areas of activity: Information Technologies, Simulation and Automatic Maintenance Systems, and Electronic Defence Equipment. Indra offers consulting, project development, and system and application integration services, and outsourcing of information systems and business processes.

INDUSTRIA DE TURBO PROPULSORES, S.A.

ITP (Industria de Turbopropulsores S.A., is a company in which Sener Aeronáutica and Rolls-Royce hold the controlling shares. Its activities include engineering, R&D, manufacturing and casting, assembly and testing of aeronautical engines and gas turbines, as well as maintenance of engines and aircraft. The ITP Group has eleven work centres located in Europe and America. In the Region of Madrid, it has facilities in Ajalvir, Getafe, San Fernando de Henares and in the city of Madrid proper.

INECO, S.A.

INECO and TIFSA are an enterprise group integrated in the Group of the Ministry of Development, which provide services in the different phases of investments in transport, with specialised areas for air transport.

INGENIERÍA DE SISTEMAS PARA LA DEFENSA DE ESPANA, S.A

Isdefe is a Spanish public sector company that provides technical engineering support and guidance regarding advanced technologies for the defence industry as well as in the area of public security and safety. It develops projects relating to command and control systems, embedded systems, communications systems, air navigation and airports and security systems.

INGENIERIA Y SERVICIOS AEROESPACIALES, S.A.

INSA is dedicated to the engineering, maintenance and operations of the segment of space systems. INSA, 100% owned by the National Aerospace Technique Institute, was founded in 1992 and inherited the experience gained by INTA Estaciones in the maintenance and operation of space communication complexes since the 1960s.

INSTER INSTALACIONES, S.A.

The INSTER Group integrates and installs turnkey systems in all kinds of communication stations, both in the civil and military environments. Aeronautical installations, especially those in the area of radio-assistance, have always been one of the most relevant parts of its daily activity.

INTEGRASYS, S.A.

Intergrasys is a company specialised in telecommunications software, and it supplies satellite and RF tracking products.

ITD - SERVICIOS DE INGENIERIA Y TECNOLOGIAS DE DISENO, S.A.

ITD is a Spanish company focused on providing services to its customers in the Design and Supply of Aircraft Systems and Components. ITD was created in December 2000 as part of the ITP Group, on the basis of its technological capabilities. ITD participates as a venture partner in different packages of the A380 programme.

LANGA INDUSTRIAL, S.A.

Langa Industrial has specialised in the design and manufacture of ground support equipment for the aerospace industry and hydraulic equipment for civil engineering.

LIDAX INGENIERIA, S.L.

Lindax Ingenieria is a specialised consultant in aeronautical, space and scientific fields and in the fields of mechanical design, structural analysis and mechanism design and analysis.

MECANIZADOS ESCRIBANO, S.L.

Mecanizados Escribano is a company that manufacturers high quality components. In 1998 it began working in the field of precision machining of aeronautical and space components. It has two production plants, one in Coslada and another in Mejorada del Campo (Madrid), and it is specialised in the machining of steels, titanium alloys, aluminium alloys, tungsten alloys, plastics and hard-to-machine materials.

MEDIA CONSULTORES DE INGENIERÍA, S.L.

MEDIA offers two types of services in the aeronautical sector: development and process engineering, and sourcing and strategy consulting specifically targeting the aeronautical market. It has taken part in several very successful programmes: CASA C-295, Missile ESSM, Eurofighter, A340, A380. It has participated as an analysis subcontractor in the major international space programmes: the ARIANE 5 launcher, satellites HISPASAT, METOP, ENVISAT, CESAR.

M.TORRES DISENOS INDUSTRIALES S.A.

The Industrial Group MTorres is formed by a group of companies dedicated to the design, development and manufacture of automation systems. Its aeronautical division focuses on the manufacture of aeronautical components, tools and packing systems. It is currently collaborating in international programmes such as Airbus A320, A330, A340, A380, A400M, Boeing B737, B747, B777, B787, Eurofighter and others.

PAGE IBERICA, S.A.

The corporate activity of PAGE has traditionally been linked to the Aeronautical Sector. This activity has led to the execution of multiple complex projects that cover practically all of the aeronautical activities, both in the Air Navigation and Air Traffic Management segment and in the Airport environment: Air Traffic Control, Surveillance and Localisation Systems, Air Navigation Aids, Aeronautical Communications, and Airport Equipment.

PARAFLY, S.A.

PARAFLY is a pioneering company in the design, development and production of personnel parachutes, payload launch systems and parachutes for unmanned vehicle recovery, as well as associated components. It currently manufactures parachutes and equipment of the following types: Personnel

Parachutes, Aerial Launch Systems, Aircraft Braking Parachutes, RPV Recovery Systems, etc.

PINTABUS, S.L.

Pintabus is a company specialised in painting, sealant application, and product assembly and tools related to the aerospace sector. Pintabus is the main paint supplier for technical parts, subassemblies and finished elements for Airbus, Boeing, EADS and Gamesa.

RADIACIÓN Y MICROONDAS, S.A

The Space and Defence Division of Rymsa was created in 1985 and its activity focuses on the design, development and manufacture of antennae and passive radiofrequency components, such as beam forming networks, filters, etc., for the flight and ground segments.

RAMEM, S.A.

Ramem is a company that designs and manufactures mechanical equipment. Ramem supplies equipment and tools to the aerospace industry for maintenance, handling and verification of aircraft and engines. Its customers include companies such as Airbus Military, Iberia, ITP, INTA, Pratt & Whitney, and the Spanish Ministry of Defence.

RODRISER, S.L.

Rodriser works, in the aeronautical field, in the areas of assembly, overhaul, repair, inspection and testing of components, subassemblies and assemblies of helicopters and other aircraft. It is a product specialist for companies such as Bell, Boeing and Eurocopter.

SENER INGENIERIA Y SISTEMAS, S.A.

Sener began operations in the space field in the late 1960s when it was awarded the tender called by the European Space Agency (at that time ESRO) for the construction of a rocket launch tower in Kiruna (Sweden). At present SENER has extensive experience in aeronautics and space in fields such as aerostructures, composite materials, systems, engines, tools, acoustics and vibrations.

SISTEMAS DE INTECONEXION S.A.

SINTERISA is specialised in the manufacture of aeronautical hardwiring, anti-corrosion, filtered, sealed and aeronautical connectors, and light aeronautical and space cable.

SKY CROSS ENGINEERS S.L.

SKY CROSS provides engineering services in different industrial sectors, including the aeronautical sector. Its areas of experience include structural, aerodynamic and fluid dynamic design and analysis, and testing and design of pneumatic electric systems and control systems. It has participated in the ARIANE 5, AIRBUS 340-600, A380, A 400-M, EMBRAER 175, and EUROFIGHTER programmes.

SPORAVIA, S.L.

Sporavia is a company created in 1998 that specialises in the maintenance of light and sport aircraft, as well as helicopters and historical airplanes.

SWIFTAIR, S.A.

Swiftair, as a JAR 145 centre authorised by the DGAC E-063, performs the maintenance of its own airplanes and third party aircraft of similar characteristics. The main maintenance base is located at Madrid-Barajas airport, and it also has line maintenance facilities at several national airports.

TCP SISTEMAS E INGENIERíA, S.L.

TCP began operating in the field of remote operation and control of scientific space mission experiments. At present, its experience and capabilities in the aerospace sector are focused on three main fields: Monitoring and Control (M&C) Systems for ground stations, collaborative remote operation systems, embarked realtime software, and control and standalone systems, etc.

TECNATOM, S.A.

Tecnatom is an engineering firm that focuses on energy sectorrelated activities. Its specialisation in non-destructive tests has favoured the diversification of Tecnatom towards the aeronautical industry and the space sector. It performs tests on materials with carbon fibre and on components made of titanium by superplastic shaping.

TECNOBIT, S.A

Tecnobit designs and produces avionics and electro-optical equipment and systems, audio management systems, and militarised computers. Tecnobit also designs, develops and produces products under specific customer requirements or else produces them under license to other companies.

TECNOLOGICA COMPONENTES ELECTRONICOS S.A.

Tecnologica Componentes Electronicos is a Spanish company specialised in the procurement of high-reliability electronic components for the space sector, as well as in services associated with Engineering, Quality, Logistics and Testing.

TEMAI INGENIEROS S.L.

TEMAI Ingenieros is an engineering firm specialised in the development of systems and applications for the areas of Artificial Vision, Testing and Data Acquisition Equipment, and Electronics. It develops simulation and test systems in aerospace and defence programmes. It develops specific test and hardware systems to meet the requirements of the main manufacturers.

THALES ALENIA SPACE ESPAA, S.A.

This is a Spanish subsidiary of the Alcatel Alenia Space Holding. It specialises in the development and manufacture of telecommunications equipment and subsystems embarked on satellites and space vehicles. It participates in the leading satellite programmes currently in progress, having supplied equipment for more than 60 space programmes. It has contributed to the construction of the satellites Galileo GIOVE A and B.

9.5.2 Andalucía

After researching the Andalusian market we have noticed that there exists a huge aeronautical market in this area. Regarding "Sector Aernoáutico en Andalucía. Informe Estadístico 2008" [27] written by Junta de Andalucía and Fundación Hélice there are about 145 companies placed in Andalucía (practically the same as in 2007). About 92% of these enterprises are located in the provinces of Seville and Cadiz, where the predominant activities are related to the assembly, tooling and mechanical activities which account for 43% of companies in the sector.

Employment in Andalusia has grown over 2008-2009 in 802 new jobs, almost 12% from the year 2007, thus amounts to 7,555 people directly employed

Province	2008 - 2009
Seville	110
Cádiz	23
Jaén	2
Córdoba	3
Málaga	6
Huelva	1

Table 9.1: Companies distribution in Andalucia by Province

in the aviation sector.

The global turnover last year has seen an increase about 72%, from 825.3 million euros in 2007 to 1417.2 in 2008. This increase is due primarily to an increase in turnover of Airbus Military fostered both by the sale of a large number of aircraft and services of its own products, such as billing for his work on the A400M program which has enabled it to recognize revenue in 2008 that failed to score in 2007. Also it is presented in this increase, the turnover of the subsidiary companies of the sector.

Continuing the trend of last year, Airbus products back to being the major contributors to the total turnover, having grown by 80.5%, representing a weight of 43% of the total, much like the products represented Airbus Military to 41%. To highlight the increase in programs such as Embraer or Eurofighter, which keep these programs leading by 17% of the total invoiced for the sector despite the large increase in total turnover.

Territorial distribution

Seville and Cádiz agglomerate over 90% of companies in the sector. This concentration in Seville and Cadiz is logical because of the presence in them of the tractor plant of Airbus Military and Airbus, and the larger industrial metalworking tradition of these provinces compared to the rest of Andalusia. A distribution of these companies along Andalucía is shown in table 9.1.

Distribution by main activity

The distribution business by activity, as reflected in the Figure 9.5, is illustrated as mechanical activities and tools (machining, sheet metal, mechanical processing, etc ...) predominate over the remaining 31%. If we add to this group of companies those whose main activity is assembling, the percentage rises to 43%. In particular, companies whose main activity is the final aircraft assembly or sub assembly made up 12% of the total, but it is the most important group in the Andalusian aeronautical sector if turnover and employment are concerned.

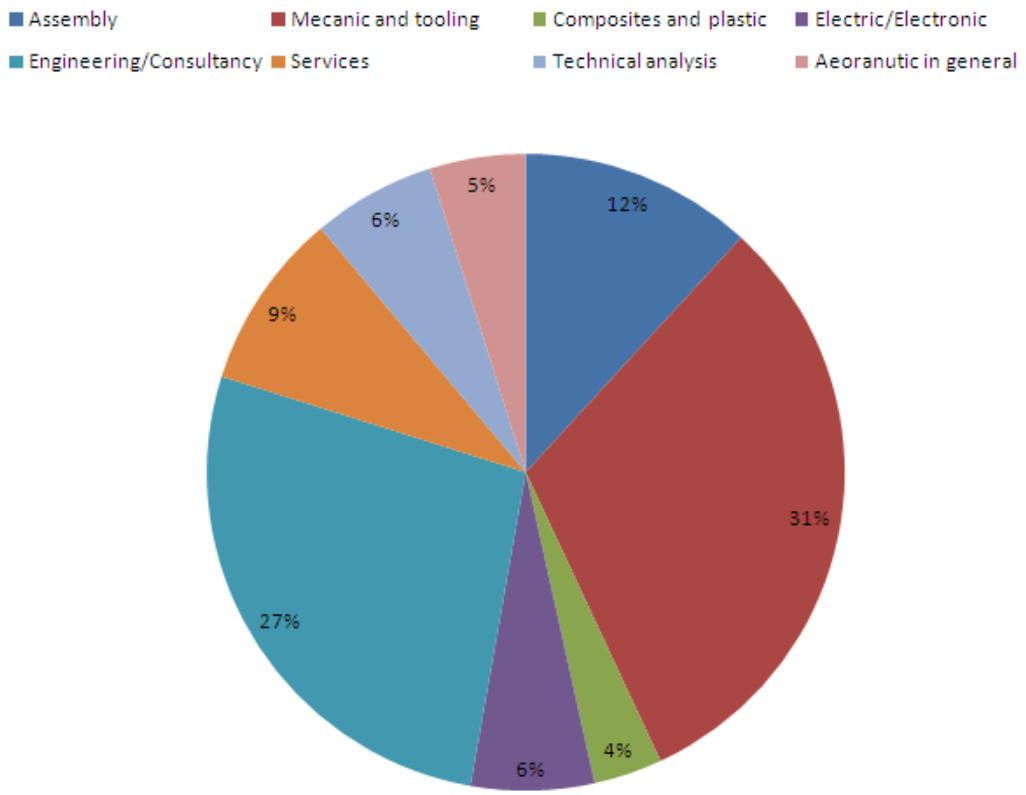

Figure 9.5: Companies distribution by main activity in Andalusia in 2009

The second group of companies is the one whose main business is "Engineering and Consulting". Despite this, their actual weight is significantly lower due to the atomization of this group, with many small size companies that are specialized in specific activities with little capacity for integration of multidisciplinary projects.

In the distribution of enterprises by activities, as shown in Figure 9.5, each company has been positioned by its core activity, and we have made the following groupings for a clearer representation of the sector:

- **Assemblies**: Final, aerostructures, engine and systems assemblies and subassemblies.
- **Mechanic activities and toolings**: Mechanic transformations, sheet metal, final processes and toolings.

Employment evolution and sales in 2001-2008

The evolution of employment and turnover in the Andalusian aeronautical sector in the period 2001-2008 is shown in Table 9.2. As noted, in 2008 the turnover in the sector has suffered a dramatic increase of 72% over the previous year, obtaining since 2001 a growth of 186.3% (922.2 million). Regarding

Year	Turnover (mill €)	Number of employees
2001	495	3,800
2002	509	3,867
2003	596.2	4,179
2004	645,4	4,516
2005	798.8	5,535
2006	848.4	6,206
2007	825.3	6,753
2008	1,417.2	7,555

Table 9.2: Employment evolution and sales in 2001-2008

the number of employees, it has continued to increase in 2008 as in previous years since 2001, reaching an increase of 98.8% (3755 jobs).

It is foreseeable that in 2009 and 2010 there is a fall due to the international crisis that we are all suffering, but it will be recovered from 2011. The drop is induced by the decrease in orders for series production programs in almost all business models. However, after this period, the recovery will grow up quicker when the A400M aircraft came into series production, it currently faces delays in implementation, and depending also on the workload that was finally assigned to Andalusian companies regarding A350.

The spectacular last year growth was partly due to revenue recognition for the development of the A400M that Airbus Military has moved from 2007 to 2008. This movement penalized growth statistics for the sector in 2007 just as increased in 2008. It also notes an increase in the assigned sales to Airbus in Andalusia and a higher volume sales of auxiliary businesses.

Aeronautic national employment

Andalucía is the second spanish region by aeronautical employment. It weights compared with other autonomous region is about 20% higher with a slight annual increase. The national distribution reveals the existence of three major regions:

1. Madrid
2. Andalucía
3. País Vasco

Company analysis in Andalucía

In the following sections we will analyze the main aeronautic companies in Andalucía. Further information is described in the appendixes.

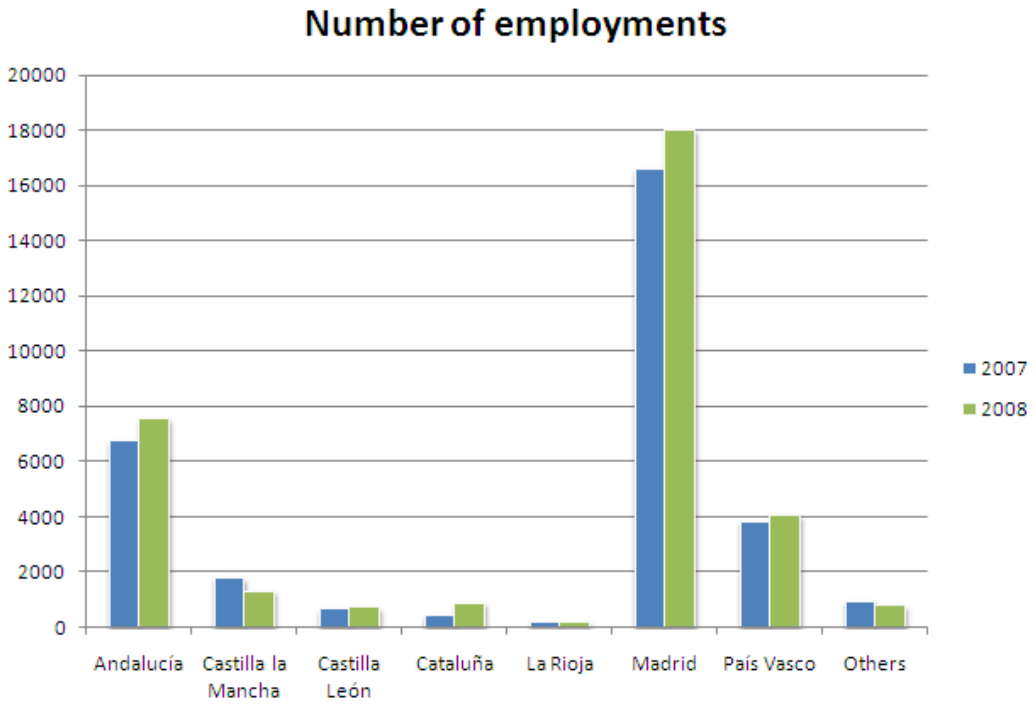

Figure 9.6: Aeronautic national employment

	2007		2008	
	Number of jobs	%	Number of jobs	%
Andalucía	6,753	22%	7,555	23%
Castilla la Mancha	1,775	6%	1,304	4%
Castilla León	654	2%	702	2%
Catalonia	436	1%	869	3%
La Rioja	156	1%	167	0%
Madrid	16,598	53%	18,019	54%
País Vasco	3,830	12%	4,045	12%
Others	934	3%	769	2%
Total	**31,136**	**100%**	**33,430**	**100%**

Table 9.3: Aeronautic national employment

Sevilla Control Group

SEVILLA AERONAUTICO CONTROL GROUP was established in 2003, with private equity firms and different technologies, within the Aerospace and Defense sector, with the aim of uniting the synergies of each, and lead a group capable of address and manage complete "turnkey" projects, providing customer service, based on security, commitment, flexibility, quality, innovation and technology, so that the evolution of its components is continuously responding to market needs.

Figure 9.7: Sevilla Control Group

The group consists of the following companies:

- SEVILLA CONTROL, SA (Machined / Sheet metal)
- AERCAL, SA (Sheet metal, Assemblies and Special Processes / Finals). Incorporacióin the group in November 2007
- A & G SEVILLA, S.L. (Comprehensive Management of material, purchasing, logistics)
- Aerostructures SEVILLA, S.L. (Group assembly, work of the final line of flight and aircraft maintenance)
- TECAER SEVILLA, S.L. (Engineering and Product Support)

A detailed map with all the facilities in Seville is shown in figure 9.8 in page 124.

The goal of "Sevilla Control" is to provide the client the possibility of hiring an entire process or any of its components or sub-components. That is, from the design to final delivery with Design, Manufacturing, logistics support, repairs ... etc.. The following activities are done by the group:

a. Engineering design

b. Setup and control engineering

c. Design and manufacture of basic tooling

d. Purchase of materials and normal

e. Manufacture of tools

f. Manufacture of basic

g. Mount sets

h. Inspection, control, quality assurance

i. Inventory and warehouse management

j. Customer support line end of flight and aircraft maintenance

k. C.n.c. machining & 5 axes Up to 6m (aluminum, steel and titanium)

l. Complete program of c.n.c. (CATIA v4 and v5)

m. Manufacture of complete sets and subsets with total management of its components

n. Aircraft sheet metal work

o. Special processes / end

p. Automation of steps (analysis of return)

q. Purchasing management, customs and import

r. Logistics, transportation, distribution, management and storage of raw materials and normal

s. Support quality with qualified inspectors and approved

t. Realization of basic work orders, subassemblies and complete sets

u. Support engineering documentary

v. Realization and maintenance of technical documentation

w. Production control programs that are supplied to the fal

x. Support material review board to non-compliance

Sevilla Control

Sevilla Control currently has the following workload:

- Medium & Light programs: C212, CN235, CN235 IPTN, C295.
- Airbus: A320, A300, A340/A300, A300/A310, A318-A319, A330/A340, A340-500-600, A300/A310, A300.

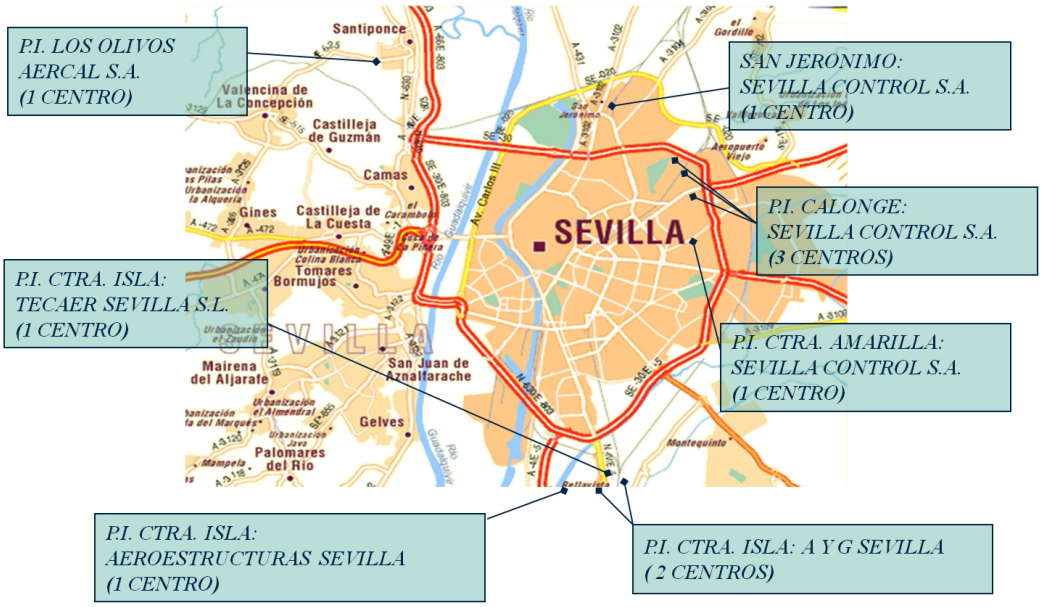

Figure 9.8: Sevilla Control Group in Seville

- Fan Cowls: A318, A340-500-600, A380.
- A400M
- EF-2000
- MRTT (A330-200)

AES

Aerostructures Sevilla, S.L. is an integration and management components company recently created in Seville, oriented to aeronautic assembly in all sectors.

Figure 9.9: AES

AES is the best present and future option for the manufacture of hulls and SS Eurofighter based on the results of recent audits (more than 99% in stock and 93% in plant) with staff already trained in similar assemblies and a firm commitment to delivering these parts to Airbus Military on time, with a very low rate of rejection of the client.

This work is considered strategic and critical to the growth of AES in the sector with strong commitment to the objectives of Airbus Military and to

continue to enhance the spirit of service and collaboration, to take account of the permanent representation in state inspection AES facilities which will benefit this military installation.

Aercal

Figure 9.10: Aercal

Aercal was formed in 1991 by members of the old company Calderinox (before the acquisition of Knossos), the date from which limited its scope to the aviation industry as storekeeper, Bending sheet metal cutters and aircraft. This activity continued until 2003. At the end of that year, began a conversion process to expand the scope of its activities with the aim of making aercal a subcontractor of EADS-CASA (now Airbus Military) supplier of basic sheet metal, machining and subassemblies.

This conversion process was conducted in phases in the context of a business plan submitted in 2003 to EADS-CASA in proposing an adjustment for a portion of their facilities and implementing a management system to achieve the required level providers to EADS-CASA, and to attain a reasonable level of independence or self-sufficiency to address the manufacturing subcontracted work respecting a strict lead-time.

Getting a low average lead-time was one of the key features of the project, given that manufacturing aercal at that time was limited to parts and AOG's.

This activity exclusive manufacturer for spares and AOG's EADS-CASA lasted until February 2007.

During that period, in December 2003 February 2007, Aercal not only consolidated its business but launched a project that would make possible the extension of that activity to address not only the manufacture of spares and AOG's, but also the product of series in order to have a definite structural loading.

Facilities

Aercal facilities currently occupy 2800 m^2, only a fraction of the total available m^2 in Santiponce (Sevilla).

Indeed, in the context of the proposed expansion of facilities mentioned

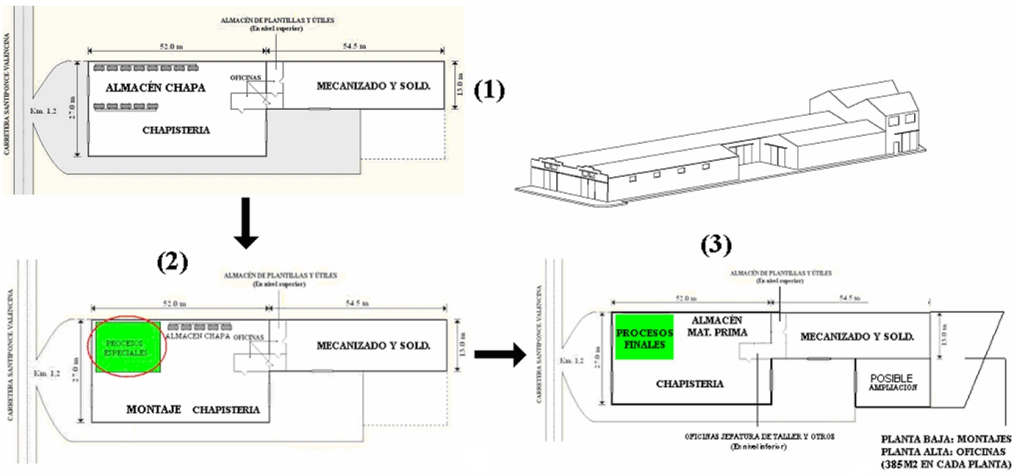

Figure 9.11: (1) November, 2003 (2) December, 2004 (3) Current situation

above, Aercal has built additional warehouses in the polygon, so that now, regardless of the aforementioned 2800 m^2, 3600 m^2 are available to accommodate future industrial aviation projects. In fact one of the new spacecraft has been equipped to undertake work aircraft. The evolution of the facility is shown in figure 9.11 on page 126.

Aernnova Andalucía

Figure 9.12: Aernnova

Aernnova Andalusia is company within Aernnova, elected to lead the assembly work on the lower left side of Section 13 of the Airbus 330 / 340.

Easa del Sur, was established in mid 2000, later re-nominated as Aernnova Andalusia in April 2007. Since then, has participated in all programs that have been developed in Aernnova. Among his most important experiences we can highlight:

- Bombardier CRJ 700/900.
- Embraer ERJ 135/145.
- Airbus A380. Section 19. Getafe Plant
- Sikorsky S-92.
- CN-212. Fuselage assembly.
- Frames ERJ-170.

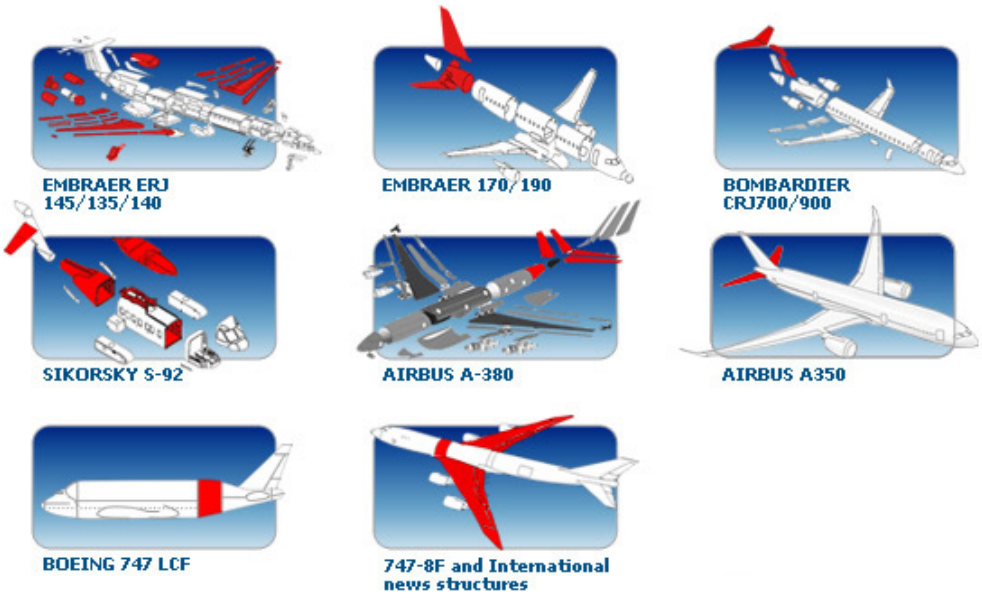

Figure 9.13: Aernnova Aerostructures

- A300 MDCD.

Among others,the products and services provided by Aernnova are the followings:

1. Integral management of complete aerostructures: conceptual design, design and development, testing, certification, prototypes and in-services support.
2. Engineering specialized in managing of complete work packages.
3. Composite and Metallic detailed part fabrication.

Although Aernnova's headquarters is placed in Vitoria (Álava), its aerosctructure business is located in "Parque Empresarial Aeronáutico Aerópolis" in Seville. That's why we are researching this company. Aernnova has a wide proven experience as integral designer and manufacturer of equipped aerostructures as we can see in figure 9.13.

They also offer highly specialized of manufacturing enginnering services for its own programs and also to the market, as well as working with metallic parts. Some jobs they are able to do are:

- Machined Parts:
  - Manufacture of large machined components.
  - Manufacture of small and medium-sized machined components

- Surface Treatments:
  - Penetrant Inspection
  - Chromic Anodizing
  - Chemical Conversion
  - Painting
  - Shoot Peening
  - Peen Forming
  - Up to 25 metres long
- Sheet Metal Parts:
  - Hydro Press
  - Rolling Press
  - Brakeforming
  - Joggles
  - Routing
  - Heat & Surface Treatments
  - Chemical Milling

Right now Aernnova has 18,000 m^2 in two facilities, and 8,000 m^2 of covered areas. They have 5 milling machines at their disposal with 2 independent spindles, 5 axes, up to 16,000 rpm, 4 milling machines for tooling and 5 machine centers.

Airgrup

Figure 9.14: Airgrup

Airgrup, S.L. is a company specialized in manufacturing of hydraulic systems, fuel, pipes, etc. in general the distribution of aircraft fluids. Airgrup is immersed in a development phase to address work packages from design stage to final delivery to the customer.

Airgrup also specializes in conducting surface protection for all auxiliary companies in the aerospace sector.

This Industrial Plan covers activities for the year 2008 the following work packages:

- MTAD FLUID DISTRIB. C-295 & CN-235
- MTAD - SECC. 19 A320, A310, A330 & A340
- MTAD - DAST POT EF-2000
- MTAD - A330/A340
- MTAD - HIDRAULIC FALCON 7XX & HTP A400 M
- MTAD - POWERPLANT A400M
- AIRBUS - HIDRAULIC HTP A320
- AIRBUS - HTP A330 & 340-600
- ITD- CONJ. SOLD. HTP A380
- FIBERTECNIC - TUBO RAMPA A320
- GAMESA - HYD & COMB. ALA EMB. 145
- GAMESA - HYD VERTICAL EMB-170
- GAMESA - HYD REAR FUS. CRJ700
- GAMESA - HYD S-92
- CESA - LANDING GEAR CN-235, C- 295 A330 & A340
- ICSA - CAPOT C-295

Easy Industrial Solutions

Figure 9.15: EASY Industrial Solutions

Easy Industrial Solutions is a young, start-up company that has grown and developed following one fundamental principle, as it is knowledge management. They have two offices in Spain, one is placed in "El Puerto de Santa María (Cádiz)" and the second one in Barcelona.

Easy Industrial Solutions has an R&D+i Centre (Research + Development + Innovation national program) next to its production facilities, where innovation programs in new materials, new applications in composed materials and improvements in production and management are developed.

The R&D+i center has all the necessary crew to develop R&D+i projects in composed materials, independent from its production center, with highly qualified human resources, engineers and technologists. This center allows experimentation at pilot plant level, due to its scale and complete equipment and facilities infrastructure, for the development of RTM, VARTM and HLU processes.

The manufacture programs are the followings:

- A320 Rib: Manufacture of end ribs for the A320 Aircraft. Client: SACESA.
- A340 Clips and angles: Manufacture of clips and angles for the A340/600 Aircraft. Client: SACESA.
- A400M Lashings: Manufacture of angles for the horizontal stabilizer (HTP) of the A400M Aircraft. Client: Airbus Military.
- A380 GP Casings: Manufacture of curing and transport casings for the FAN COWL of the GP version A380 Aircraft. Client: Airbus Military.
- A380 T900 Casings: Manufacture of curing and transport casings for the FAN COWL of the T900 version A380 Aircraft. Client: Airbus Military.
- A340 Casings: Manufacture of curing and transport casings for the FAN COWL of the A340 Aircraft. Client: Airbus Military.
- A340 Kits: Kits cut for the manufacture of longitudinal Omegas of the A340 Aircraft. Client: Airbus Military.
- A380 GP Kits: Kits cut for the manufacture of longitudinal Omegas of the GP version A380 Aircraft. Client: Airbus Military.
- A380 T900 Kits: Kits cut for the manufacture of longitudinal Omegas of the T900 version A380 Aircraft. Client: Airbus Military.
- A380 Wedges: Manufacture of wedges of the A380-TIM program (RUDDER&ELEVATOR) Client: ARESA.
- Shims: Manufacture of flat and wedged shims for the A380, A320, A310 and A340 programs. Client: AIRBUS.

Inespasa

Figure 9.16: Inespasa

Founded in Seville in 1986 under the name of Talleres Lobillo, INESPASA is today a leading company in the design, manufacture, assembly of tooling, aeronautical parts machining and mounting of assemblies. INESPASA concentrates its activities in the aeronautical and automotive sectors and has among its list of clients such important companies as AIRBUS, AIRBUS MILITARY, BOEING, GAMESA, SACESA and RENAULT.

Machine tool manufacture the result of two decades of confirmed experience in developing both small tools and assembling large tooling for the production of large assemblies is one of the INESPASAs greatest strength. Thanks to the wide range of machinery available , INESPASA has a versatility that enables it to cover the broad map that defines the typology of tools, for both manufacturing and assembly, as well as offering the possibility of responding almost instantly to any critical point in the archievement of any proyect.

INESPASA has a wide range of machining equipment, which is subject to a constant process of modernisation attending to both technological and comercial needs.

Thus, they have incorporated into our inventory the most advanced machining centres in 3 and 5 axis, high-speed technologies.

Elimco

ELIMCO creates high added-value technological solutions, specially adapted to the requirements and demands of its clients, in a range of innovative projects which are characterised by excellence in management.

The company's constant growth and commitment to diversification inspires projects of great magnitude, whilst adapting to new market demands, anticipating clients needs and dedicating itself to technological innovation.

After years of experience within the market, ELIMCO has consolidated its traditional business activities, whilst reaching new markets and introducing new activities which contribute to the production of wealth and employment.

They aim to become a firm leader concerning technological development and business diversification on an international level, whilst experiencing constant growth as an organisation renowned for its social responsibility.

Figure 9.17: Elimco

Figure 9.18: Elimco's integration test bench

Elimco's Portfolio

ELIMCO is an international reference in engineering, integration, production and maintenance of multidisciplinary systems. Its business core is the electrics, the electronics and the avionics, operating both in the sector of Defence and Civil.

It is expert in integral management of such products as innovative automatic systems of tests, simulators, on-board harnesses, control units of cockpit, consoles and on-board equipment with high complexity, as well as customer support services, fundamentally in-field engineering, MRO, ILS and electrical and avionic transformations in FAL between other services.

ELIMCO carries out a real bet for the project achievement in the form of integral management (development, design, manufacturing, programming SW, commissioning, integration, operation, training, maintenance) and for the adaptability to the customers needs, acting as provider and partner of the first level (tier one supplier) for the most significant airships integration companies.

The creation of added value and the contribution of high technological and innovative factor are the signs of identity which escort to the company in all the programs with high technological contents where it operates.

The main activities of Elimco are:

- Integration Test Bench: ELIMCO is an expert in Testing Systems, including Integration Test Benches. It offers its clients a complete and customized solution which includes design, production, system testing, software installation and configuration and integration support in the clients installations.
- Avionics Test Bench: An automatic avionics testing system. Using radio frequency devices, it fully tests the avionics of an aircraft on the final assembly line. The control software can be configured entirely by the user and offers three function modes: manual, automatic and external. The simulation system is in a radio frequency using a remote antenna switch system which optimizes the radiation of the signals.
- Pneumatic Test Bench: The main function of this system is to check and carry out all the pressure testing required for different aeroplane systems. It allows the user to control and oversee pneumatic testing and to check the existence of possible leaks and the resistance to given pressure levels of the different elements tested. This can be done either automatically or manually, by introducing compressed air, nitrogen or either one mixed with helium.

These are some of the programs in which ELIMCO takes part:

- C-295 (All versions, included CLX)
- CN-235
- C-212
- DEEPWATER (US Coast Guard)
- SASEMAR / Maritime Patrol
- A310-A330 BOOM MRTT RAAF
- A400M
- A320
- A340
- EUROFIGHTER
- TIGER
- EC-135
- NH90
- P3 ORION BRAZIL & EA

Figure 9.19: ALESTIS

ALESTIS

Alestis Aerospace is one of the biggest aeronautical supplier company in Andalusia. It is formed by many shareholders: institutional, financial and industrial; in the same proportion. About 70% of the capital is owned by Andalusian people.

The first group is "Agencia de Innovación y Desarrollo de Andalucía (IDEA)" that owns 25 M€ and SACESA who owns 42%. The second are the Andalusian banks: Unicaja has 20M€ and 10% of SACESA, Cajasol 20M€ and 20%of SACESA and BEF contributes 10M€. The third group include the industrial partners.

Within these industrial partners, "Grupo Alcor" contributes with nine productive factories: five in Andalusia, three in the Basque Country and one in Brasil. They are the second biggest shareholder with Agencia Idea. Ficosa, the Catalonian international company, has cut his participation to 15M€ and Airbus Military contributes with its 26% of Sacesa.

Alestis has signed a 1,000M€ contract to manufacture the Airbus A350 belly fairing. This contract will create about 1,000 direct jobs and almost 3,000 indirect ones for the next 15 years. The company also has a contract with Airbus to develop the section 19.1 of this aircraft.

The director of IDEA Agency is Jacinto Canete and he is in chair of the project and the company. Gaizka Grajales is the managing director. Another some members of the agency are Diego García Galán, Program Manager, Rafael Pax as Engineering Manager, Antonio Carrión as Human Resources Manager and César Fernández as General Manager.

In the following sectors some of these companies will be analyzed. Moreover, Appendix A offers additional information about the rest of the companies in Andalusia.

SACESA

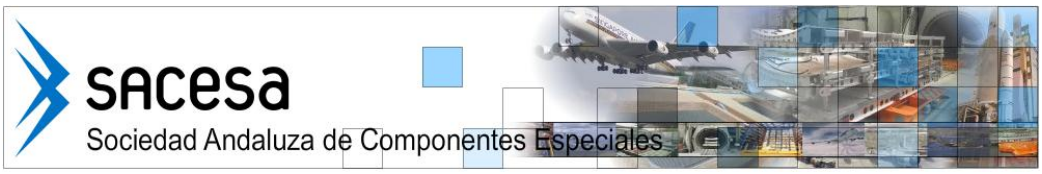

Figure 9.20: Sacesa

Sociedad Andaluza de Componentes Especiales S.A. (S.A.C.E.S.A.) was founded in 1995 when they bought "High Tecnhology Composites S.A. (H.T.C.)". It was created by "Instituto de Fomento de Andalucía, I.F.A. (nowadays I.D.E.A.) and it is the only aeronautic Spanish company able to manufacture carbon fiber elements. It main shareholders are Airbus Military, IDEA, Caja de Ahorros San Fernando, Unicaja y El Monte.

SACESA has 29 valid contracts with Airbus Military: carbon fiber pieces for C-212, ultrasonique inspection, different manufacturing process for CN-235 and C-295, FAN COWL A340-500/600, tops oil tank, BOEING 777 and so on.

Grupo Alcor

Figure 9.21: Grupo Alcor

The ALCOR Group is an industrial group, the objective of which is the creation and development of technological companies in the fields of aeronautics, automotion, and new technologies.

It is the intention of the ALCOR Group to set up front-line companies in the mentioned sectors, with the intention to develop and manufacture innovative products together with its customers.

The ALCOR Group initiates its activity in 1994 in 2 business fields that it has mantained up to the present day, but which it has not stopped developing: Aeronautics and Automotion.

The formation of the Group started with the purchase of a small automotion company (SLAJOAR) and with the setting up of a new company in the aeronautic field (SK1O).

In 1996, the IDEC engineering company is set up (in which ALCOR is not a majority shareholder) with 2 main objectives:

- to provide engineering support for other companies.
- to develop composite technologies.

In 1999 POLUX is set up, in Pamplona, as there is a nucleus of automotive companies in the area, with a view to obtaining a bigger market share in the automotive sector.

In 2003 "SK10 Andalucía" is set up in Cadiz with the objective of providing service to the two big Spanish companies, which are, for the most part, situated in Andalucia: CASA and AIRBUS. That same year Alcor starts participating in a French Group that has 3 areas of business: aeronautics, public works and their own products and which complements the activities of the companies of the ALCOR Group.

In 2004 the Alcor buys the TGA society (currently SK 3000), localized in Seville and that complements the presence of Alcor in the Andalusian aeronautic sector.

With the launching of the Airbus A380 program, the SK380 society is set up in Vitoria, in 2004. This is the company is to work in all the projects related with the Airbus A380 in Vitoria.

That same year the LEGAIRE company is set up. The idea is that this company is to participate in new initiatives that are conceived within the ALcor Group but that are outside its two main fields of activity: aeronautics and automotion.

In 2004 Alcor buys a minority participation in MUÑOZ so as to be able to exercise more control over the special machine design for the manufacture of automotion components, a key area in SALJOAR's strategy.

As for SK10, in 2004 it went through a restructuring process with a view to split up into different companies the different activities it carried out. These new companies are:

- SK 2024
- SK epsilon
- SK10 Desarrollo y Tecnología

To conclude this brief description it is necessary to point out that the Alcor Group is a patrimonial concern that also services the companies of the group in certain fields (financial, legal, fiscal fields), but has no industrial activity. Each company, therefore, has its own management in all of its fields of action, and only financial, legal, and fiscal aspects are managed by the ALCOR Group itself.

The companies in the aeronautical business are dedicated to the manufacturing of components for aeronautic structures. The materials used are

aluminium and titanium alloys together with composites (carbon fibre,...). The companies integrated in this area are:

- SK2024 Aeronáutica, S.L. (SK2024)
- SK epsilon Aeronáutica, S.L. (SK epsilon)
- SK10 Desarrollo y Tecnología, S.L. (SK1O DT)
- SK380, S.L. (SK380)
- SK10 Andalucía, S.A. (SK10 Andalucía)
- SK3000 Aeronáutica, S.A. (SK3000)

SK 2024

SK2O24 is a supplier of aeronautic structures and parts that works directly with the main aeronautic constructors. Its philosophy is to be a subcontractor that is capable of offering a final product, taking part in the projects as from their conception. The activities of SK2O24 all fall within the field of de-

Figure 9.22: SK 2024

sign and manufacture of structural components for the aeronautic industry. Such components can be either metallic or composite.

SK Epsilon

SK epsilon is a supplier of special alloy and composite material aeronautic structures, which works with the main aircraft manufacturers. Its philosophy is to be a subcontractor that is capable of offering a final product, taking part in the projects as from their conception.

Figure 9.23: SK epsilon

The activities of SK epsilon all fall within the field of design and manufacture of structural components for the aeronautic industry. Such components can be either metallic, or composite, o a mixture of both.

SK 10 Andalucía

SK1O Andalucía is a supplier of special alloy and composite material aeronautic structures, which works with the main aircraft manufacturers. Its philosophy is to be a subcontractor that is capable of offering a final product, taking part in the projects as from their conception.

Figure 9.24: SK 10 Andalucia

The activities of SK10 Andalucía all fall within the field of design and manufacture of structural components for the aeronautic industry. Such components can be either metallic, composite, or a mixture of both.

The objective of SK10 Andalucía is to offer the most complete solution for its customers' needs, always procuring maximum integration of its products, from design to manufacture. For this purpose it has the necessary installations to carry out a wide variety of processes, and those that are not available in the company are carried out within other companies in the Alcor Group or within its network of subcontractors.

SK 380

SK380 is a supplier of aeronautic structures in special alloys and in composite materials for Airbus A380 programs. The objective of this company is to manage projects from design to final delivery.

Figure 9.25: SK 380

The activities of SK380 all fall within the field of design and manufacture of structural components for the aeronautic industry. Such components can be either metallic, or composite, or a mixture of both.

The main technologies used in SK380 are as follows:

- Metal parts assembly: Metal-to-metal assembly (machined parts-to-plate or plate-to-plate). These are special assemblies that are made with rivets and light alloy highly resistant inserts, and with various types of adhesives and sealants.

- Composite material parts assembly: Composite-to-composite or composite-to-metal assemblies. These are special assemblies that are made with rivets and light alloy highly resistant inserts, and with various types of adhesives and sealants.
- Structural repairs of composite material parts: These are carried out in rooms in which temperature and humidity are controlled by means of application of heat and pressure in concrete areas (to be repaired) of the part.
- Application of sealants: Interface protection or protection by inserting shielding materials in certain areas so as to avoid corrosion, aggression by humidity or hydraulic oils.
- Paint: Paint spraying.

SK 3000

SK3000 is a supplier of special alloy and composite material aeronautic structures, which works with the main aircraft manufacturers. Its philosophy is to be a subcontractor that is capable of offering a final product, taking part in the projects as from their conception.

Figure 9.26: SK 3000

Airbus Military

Figure 9.27: Airbus Military

Airbus Military designs, manufactures and sells special mission aircraft for specialised military and security tasks such as in-flight refuelling capabilities or maritime surveillance. Products include heavy, medium and light transports, as well as the Airbus based tankers, which leverage all the efficiencies of Airbus commercial aircraft. Major programmes and products are: A330 MRTT, A400M, CN-235 and C-295.

The A330 MRTT (Multi-Role Transport Tanker) is the world's leading air-to-air refuelling aircraft with a huge basic fuel capacity. It has been selected by air forces in the United States (with Northrop Grumman as prime contractor), Australia, the Middle East and the United Kingdom. Fuel is passed through an innovative fly-by-wire refuelling boom that delivers a larger refuelling envelope and better control than other systems. The aircraft is a derivative of the successful Airbus A330/A340 Family. The A330 MRTT had its first flight in June 2007.

The A400M is designed to replace ageing fleets of heavy transport aircraft in service with air forces around the world. It has more than twice the payload and volume of the aircraft it is intended to replace.

The Airbus Military CN-235 and C-295 are medium-weight, twin-engine turboprop transport aircraft capable of operating from short and unpaved runways. They are world leaders in their category, serving air forces all over the world.

Main Airbus' facilities are the following:

Centro Bahía de Cádiz (CBC): Stands out by the technology used in fabrication of structures and components of carbon fiber through the curb, in superplastic forming technology and integrated bodywork.

Puerto Real (Cádiz): Is dedicated to the assembly of aerostructures in metallic materials and carbon fiber for the civil aviation division horizontal/vertical tail plane for the Airbus family.

San Pablo FAL: This factory is performing final assembly, test system and equipped military aircraft C212, C295, C235 and A400M.

Tablada: Is principally involved in the assembly of aerostructures, CNC high speed machining, stretch forming and chemical milling coating.

9.5.3 Basque Aerospace Cluster

HEGAN is a non-profit private association which groups together the Basque aerospace entities of the Basque Country, whose aim in to strengthen, promote and stimulate the aerospace sector in the Basque Country. Its mission is to contribute to the creation of new high-quality jobs, our society scientifical and technical development and the consolidation of our industry in a better future and more added value activities.

HEGAN aims to represent the Basque Aeronautical and Space sector and to become an international reference as a cluster association provide answers to the strategic challenges by acting in cooperation.

In 2009, total turnover in Basque Aerospace Cluster was 1,229 million € [35] and the distribution is shown in figure 9.28. Figure 9.29 shows the sells

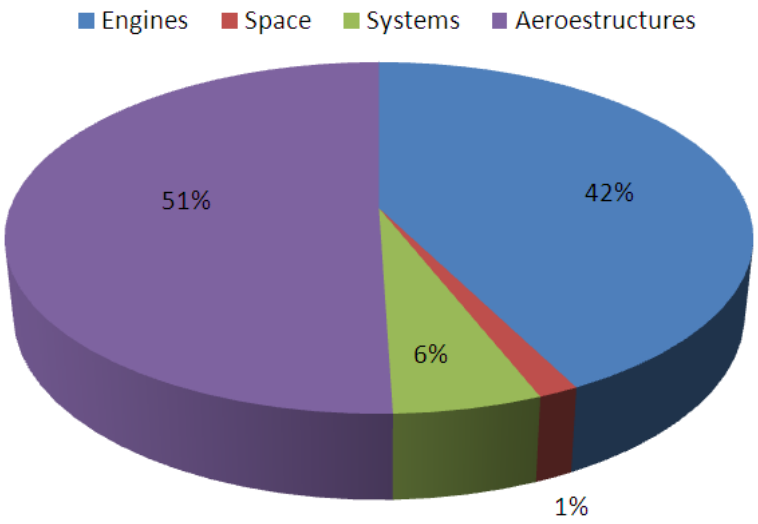

Figure 9.28: HEGAN total turnover by categories in 2009

Activity	Aragón	Catalonia	Total
Services and consulting	9	28	37
Electricity and electronic	2	4	6
Manufacturing and assembly	10	9	19

Table 9.4: Aragón-Catalonia aeronautic companies in 2009

in the different activities.

9.5.4 Aragón-Catalonia Cluster

Last years the Aragón-Catalonia's cluster has experimented a huge grow turning out in 21 companies in Aragón and more than 40 in Catalonia. Table 9.4 details the amount of aeronautic companies established in Aragón and Catalonia. As we can see, manufacturing and assembly means an important part of this figure.

9.6 Segmentation

The company must study its customer markets closely. According to Kotler [36] there are six types of customer markets which are represented in Figure 9.30. Consumer markets consist of individuals and households that buy goods and services for personal consumption. Business markets buy goods and services for further processing or for use in their production process, whereas reseller markets buy goods and services to resell at a profit. This is the market we will approach to. Institutional markets are made up of

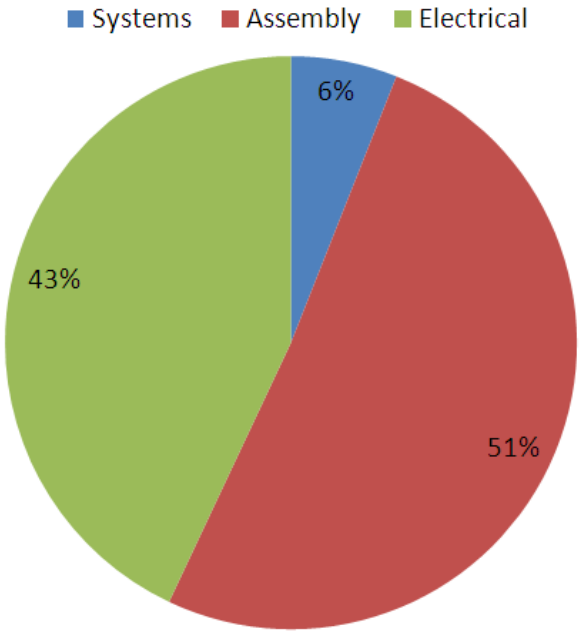

Figure 9.29: Sales distribution of HEGAN in 2009

schools, hospitals, nursing homes, prisons and other institutions that provide goods and services to people in their care. Government markets are made up of government agencies that buy goods and services in order to produce public services or transfer the goods and services to others who need them. Finally, international markets consist of buyers in other countries, including consumers, producers, resellers and governments. Each market type has special characteristics what call for careful study by the seller. At any point in time, the firm may deal with one or more customer markets.

Customers are different among them; therefore, the enterprises must understand those needs and adapt their value propositions to each target segment. In our case the customers are the different aeronautical manufacturers, therefore we must analyze the business markets instead of consumer markets. We need to segment this business markets because there are different business opportunities by each segment.

The objective is to understand the principal needs and behaviours of each kind of customer/segment and understanding their relative value. What segments should we select as target? Consumer and business marketers use many of the same variables to segment their markets. Business buyers segment geographically or by benefits sought, user status, usage rate, loyalty status, readiness state and attitudes. Yet business marketers also use some additional variables which, as Table 9.5 shows, include business customer demographics (industry, company size); operating characteristics; buying approaches; situational factors; and personal characteristics.

The table lists important questions that business marketers should ask in determining which customers they want to serve. By going after segments

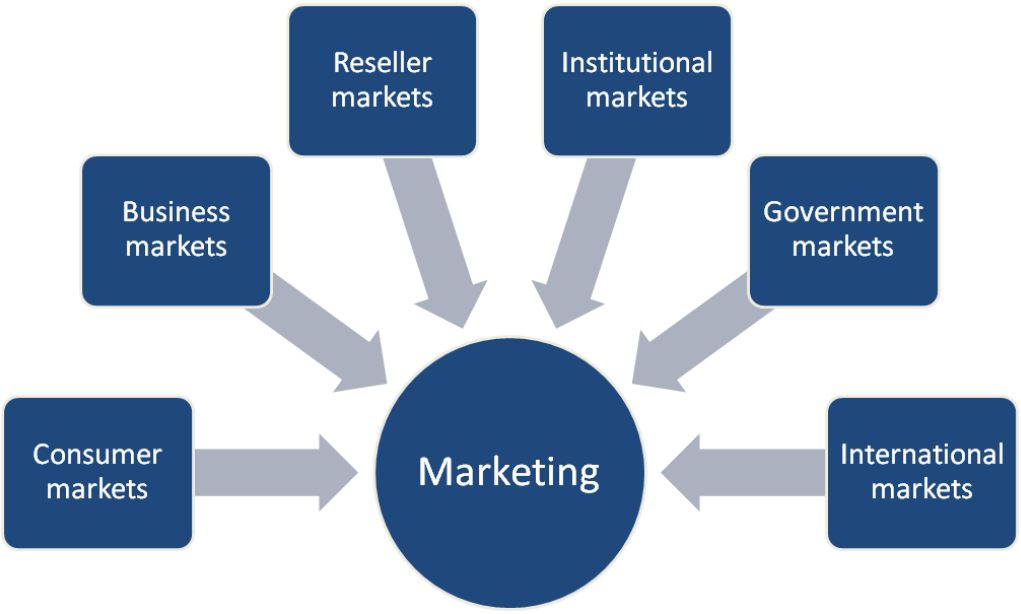

Figure 9.30: Type of customer market

instead of the whole market, companies have a much better chance to deliver value to consumers and to receive maximum rewards for close attention to consumer needs.

Within the chosen industry, a company can further segment by customer size or geographic location. The company might set up separate systems for dealing with larger or multiple-location customers. Within a given target industry and customer size, the company can segment by purchase approaches and criteria. However, as in consumer segmentation, many marketers believe that buying behaviour and benefits provide the best basis for segmenting business markets.

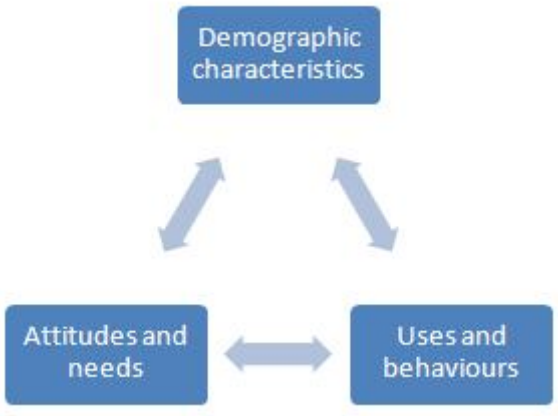

Figure 9.31: Consumer segmentation dimensions

The typical consumer segmentation dimensions is shown on page 143 in figure 9.31. Demographic characteristics describe who the customer is, the geographical location, business revenue, etc. Uses and behaviors define the products and services, account information, equipment, etc. Attitudes and needs refer to what they think and what they need.

9.6.1 Business Market Versus the Consumer Market

The business market consists of all the organizations that acquire goods and services used in the production of other products or services that are sold, rented, or supplied to others. Business markets have several characteristics that contrast sharply with those of consumer markets:

- Fewer, larger buyers: The business marketer normally deals with far fewer, much larger buyers than the consumer marketer does.
- Close supplier-customer relationship. Because of the smaller customer base and the importance and power of the larger customers, suppliers are frequently expected to customize their offerings to individual business customer needs. Business buyers often select suppliers who also buy from them.
- Professional purchasing. Business goods are often purchased by trained purchasing agents, who must follow their organizations' purchasing policies, constraints, and requirements. Many of the buying instruments (for example, requests for quotations, proposals, and purchase contracts) are not typically found in consumer buying.
- Several buying influences. More people typically influence business buying decisions. Buying committees consisting of technical experts and even senior management are common in the purchase of major goods.
- Multiple sales calls. Because more people are involved in the selling process, it takes multiple sales calls to win most business orders, and some sales cycles can take years.
- Derived demand. The demand for business goods is ultimately derived from the demand for consumer goods. For this reason, the business marketer must closely monitor the buying patterns of ultimate consumers.
- Inelastic demand. The total demand for many business goods and services is inelastic that is, not much affected by price changes.
- Fluctuating demand. The demand for business goods and services tends to be more volatile than the demand for consumer goods and services. A given percentage increase in consumer demand can lead to

a much larger percentage increase in the demand for plant and equipment necessary to produce the additional output. Economists refer to this as the acceleration effect.

- Direct purchasing. Business buyers often buy directly from manufacturers rather than through intermediaries, especially items that are technically complex or expensive (such as mainframes or aircraft).

9.6.2 Brainstorming

The dimensions selected for this marketing plan are shown in Table 9.5 on page 146. In order to define who our customer is we have chosen different axes.

According to the Demographic dimension we have defined the location of the company, its size and kind of industry. About the industry we will focus on the aeronautical sector where we have found a niche in the market. Geographical location is implemented because one of our main goals is to work initially in a local environment (working with companies near to our office is an important point to take into account). The size of the company refers to number of employees, revenues, net income and so on.

About "Operating variables" we remark the fact that we will focus on those companies which have a system to control the inventory but are interested in a new one. In terms of "Purchasing approaches" the idea is to analyze which companies we should focus depending on the power structure, purchasing criteria, etc. "Situational factors" mean which kind of services are needed by the company: urgent deliveries, specific applications, size of order. Finally, "Personal characteristics" refers to relationship we have with the customer.

9.6.3 Segment Matrix

A market segment consists of a group of customers who share a similar set of needs and wants. We must be careful not to confuse a segment and a sector.

The marketer does not create the segments; the marketer's task is to identify the segments and decide which one(s) to target. Segment marketing offers key benefits over mass marketing. The company can presumably better design, price, disclose and deliver the product or service to satisfy the target market. The company also can fine-tune the marketing program and activities to better reflect competitors' marketing.

Market segments can be defined in many different ways. One way to carve up a market is to identify preference segments. Three different patterns can emerge:

Demographics	
Industry	Which industries that buy this product should we focus on?
Company size	What size companies should we focus on?
Location	What geographical areas should we focus on?
Operating variables	
Technology	What customer technologies should we focus on?
User/non-user status	Should we focus on heavy, medium or light users, or non-users?
Customer capabilities	Should we focus on customers needing many services or few services?
Purchasing approaches	
Purchasing organizations	Should we focus on highly centralized or decentralized companies?
Power structure	Focus on companies that are engineering, financially or marketing dominated?
Relationships	Should we focus on companies with we already have strong relationships?
General purchase policies	Should we focus on companies that prefer leasing, service contracts, etc.?
Purchasing criteria	Should we focus on companies that are seeking quality? Service? Price?
Situational factors	
Urgency	Should we focus on companies that need quick delivery or service?
Specific application	Should we focus on certain applications of our product rather than all applications?
Size of order	Should we focus on large or small orders?
Personal characteristics	
Buyer-seller similarity	Should we focus on companies whose people and values are similar to ours?
Attitudes towards risk	Should we focus on risk-taking or risk-avoiding customers?
Loyalty	Should we focus on companies that show high loyalty to their suppliers?

Table 9.5: Brainstorming of dimensions

1. **Homogeneous preferences**: A market where all the consumers have roughly the same preferences. The market shows no natural segments.

2. **Diffused preferences**: At the other extreme, consumer preferences may be scattered throughout the space, indicating that consumers vary greatly in their preferences. The first brand to enter the market is likely to position itself to appeal to the most people. A second competitor could locate next to the first brand and fight for market share, or it could locate in a corner to attract a customer group that was not satisfied with the center brand. If several brands are in the market, they are likely to position themselves throughout the space and show real differences to match differences in consumer preference.

3. **Clustered preferences**: The market might reveal distinct preference clusters, called natural market segments. The first firm in this market has three options. It might position in the center, hoping to appeal to all groups. Another choice would be to position itself in the largest market segment (concentrated marketing). Finally, another possibility is to develop several brands, each positioned in a different segment. If the first firm developed only one brand, competitors would enter and introduce brands in the other segments.

As we want to be the first firm getting into this market our objective is to position ourselves in the largest market segment by introducing a standard product.

From the entire axes shown in table 9.5, we will focus our marketing plan on the location of the company and their activity.

The first one states where is located the biggest group of companies in Spain (or at least, the group with the highest value). Choosing a good place where establishing our company will help us to contact the biggest number of companies. The second one will be used to work out the value of the implementation. The more items needed to be controlled the more profitable business it will be for our company.

We have grouped the different activities of the companies in three main groups because we think our product could be more productive for the customer depending on this factor. As we have explained in the previous chapters of this Business Plan, the main idea is to use the RFID technology to locate the different tools in the company. Hence we must differentiate between those companies who could have more toolings in their inventories.The three categories we have pointed out are:

- **Group 1**: Mechanics, Assembly, Subassembly, Engines subset, Accessories, Substructures and Fuselage, Hydraulic and Pneumatics systems, Structural systems and Components.

- **Group 2**: Navigation systems, Electric and Electronic systems.

- **Group 3**: Engineering, Consultancy, Services and others

On the other hand, as we have seen in the market research, the great majority of aeronautical companies are placed either in Madrid, Andalucía, País Vasco or Aragón & Catalonia. We think that this fact is important in order to establish our company in a well located area.

9.7 Targeting

After the market research in the different Spanish regions (Andalucía, Madrid, País Vasco and Aragón & Catalonia) we have selected seven different segments for our product. This classification is shown in figure 9.32 in page 149. Although in the four locations there are companies which activity is included within group 1,2 or 3, we have only remarked those segment where there exists a considerable amount of companies in a group.

Once we have identified this opportunities we need to decide how many and which ones to target. Marketers are increasingly combining several variables in an effort to identify smaller, better-defined target groups.

In evaluating different market segments, the firm must look at two factors: the segment's overall attractiveness and the company's objectives and resources.After evaluating different segments, the company can consider five patterns of target market selection:

1. Single-segment concentration
2. Selective specialization
3. Product specialization
4. Market specialization
5. Full market coverage

Our company has decided to apply a single-segment concentration. Through concentrated marketing, the firm gains a strong knowledge of the segment's needs and achieves a strong market presence. Furthermore, the firm enjoys operating economies through specializing its production, distribution, and promotion. If it captures segment leadership, the firm can earn a high return on its investment.

However, there are risks. A particular market segment can turn sour or a competitor may invade the segment. For these reasons, many companies prefer to operate in more than one segment. If selecting more than one segment to serve, a company should pay close attention to segment interrelationships on the cost, performance, and technology side. A company carrying fixed costs (sales force, store outlets) can add products to absorb and share some costs. The sales force will sell additional products, and a fast-food outlet will

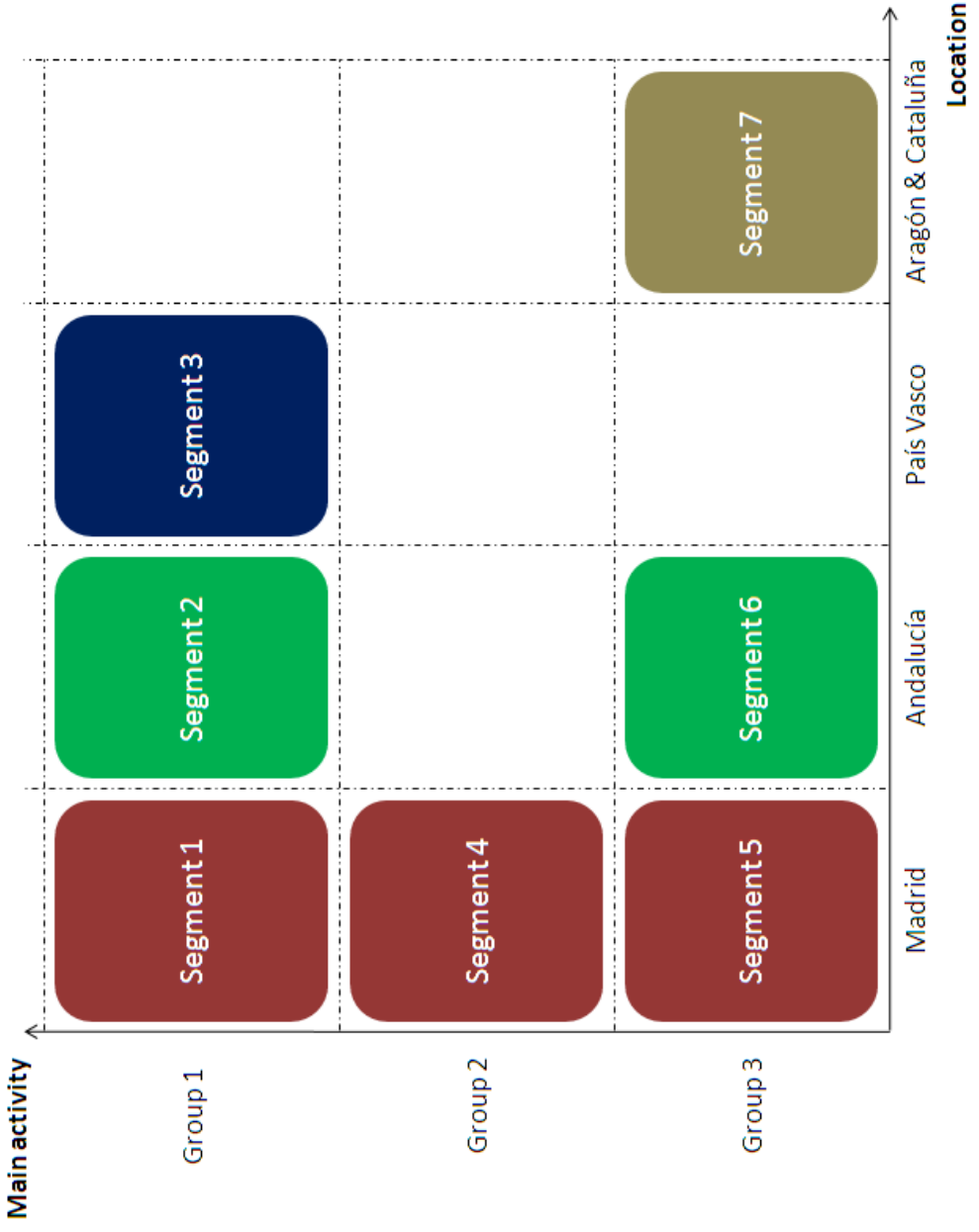

Figure 9.32: Proposed segmentation

Location	Group 1	Group 2	Group 3	Total
Madrid	21	22	30	73
Andalucía	75	9	61	145
Aragón & Catalonia	19	6	37	62
País Vasco	30	15	14	59
Total	**115**	**37**	**128**	**280**

Table 9.6: Amount of companies by activity and location

offer additional menu items. Economies of scope can be just as important as economies of scale.

Companies can try to operate in supersegments rather than in isolated segments. A supersegment is a set of segments sharing some exploitable similarity. In our case, we can specialize in Assembly and manufacturing groups but in different locations such as Andalucía, Madrid, etc.

The best way to manage multiple segments is to appoint segment managers with sufficient authority and responsibility for building the segment's business. At the same time, segment managers should not be so focused as to resist cooperating with other groups in the company. We will consider these issues when we consider to expand our business.

In order to decide one-single segment we must work out the value and competitive fit for each segment.

9.7.1 Value

The value of each segment is function of the number of customers, their current needs and the future needs: potential ARPU (Average Revenues Per User). For that we must define which of the different groups has more value for us. As we have explained in the previous section, we have divided the activities of the companies in three different groups: group 1, 2 and 3.

The kind of company that has more value for us, is the one that will require more elements to classify. In other words, those companies that have more toolings to be controlled. This valuation is shown in figure 9.33

However we also must take into account the number of companies in each category. Maybe, the group number one could have more value for us (in terms of items) but in the group number 2 there exists a higher number of companies. In table 9.6 we can see the different amount of companies in each segment and each location. These figures will help us to evaluate the possible value of each segment.

In principle our best option is to target companies in group number 1, but as we said before we should take into account the possibility of targeting

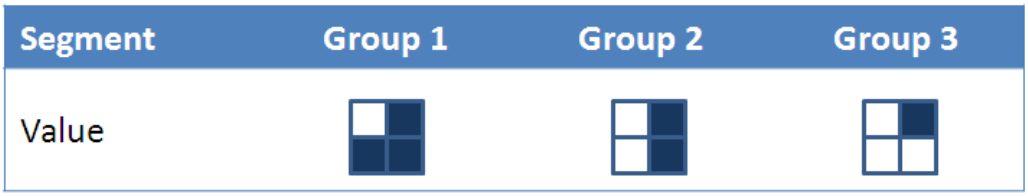

Figure 9.33: Segment Value for the different groups. Group 1 has the highest value.

segments in another groups because they could have a higher number of companies within it.

If we put the amount of companies on top the proposed segmentation the result is figure 9.34 we can see that the highest value of companies in all groups is in Segment 2.

9.7.2 Competitive fit

The competitive fit covers the factors that determine the capability to compete in a distinctive way. The objective is to estimate our capability to penetrate each segment. Compete means to be able to convince the customer to buy our product, and to able to convince the customer to buy the product to our company.

The key factors to measure the competitive fit are the competitive intensity and the capability to compete. These factors are shown in the illustration 9.35 on page 153.

About the competitive intensity there are different dimensions. Regarding the situation and positioning in the market, we must study the percentage of the market that we have. As we are a new company, this number is zero but this percentage will increase in the following years. We have detected the existence of non covered demand in the aeronautic sector and it will help us to increase the market share. Competitive strategies mean the communication objectives of the company, the behaviors to the customer and the financial capability of the enterprise.

According to Michael Porter's studies [33], the competitive intensity is bigger if:

- There are many more competitors in the segment.
- The percentages of the market that the competitors have are similar, without big players that define the rules of the segment.
- All the market is captured (reached the maximum penetration)

Figure 9.34: Proposed segmentation including the number of companies

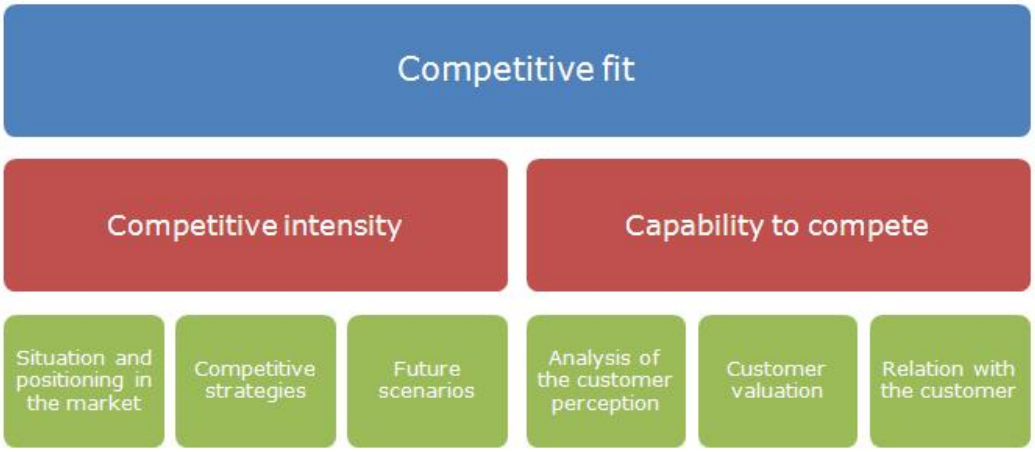

Figure 9.35: Dimensions analaysis to estimate the Competitive fit

Furthermore, in order to analyze the market positioning we must take into account not only the internal factors, but also the external ones. Apart from considering the suppliers, the customers, the possible substitutes and the new entrants, we should also take care about the new technologies showing up in the market, the new regulations that could affect our product, forecasting the future demand as well as the macro-economic aspects. All these aspects are included in the internal and external forces model by M. Porter shown in figure 9.36.

In terms of the capability to compete we must evaluate the competitive perception of the customer for each segment, as well as for the principal buy drivers. We need to understand the strengths and weaknesses perceived by the customer and the map of perception among competitors. Although the analysis of competitive data allows us to have a first idea, the important thing is to understand the customer perception of our company and the competitors.

Nevertheless, the most important factor is about the knowledge we have about the segment and the possible contacts. In this way, those segments placed in Andalucía are better for us, because of the company's relationship with these location. All the shareholders of the company have worked in Airbus Military in Sevilla, and they all have contact with many subcontractors around this area.

The result of this analysis is shown in figure 9.37 on page 155, where the location of Andalucía provides the biggest competitive fit for us.

9.7.3 Segmentation Strategy

The result of evaluating the value and competitive of the different segments, is shown in figure 9.38. As we can see, the best segment is number 2: companies located in Andalucía which main activity is related with assembling, engines,

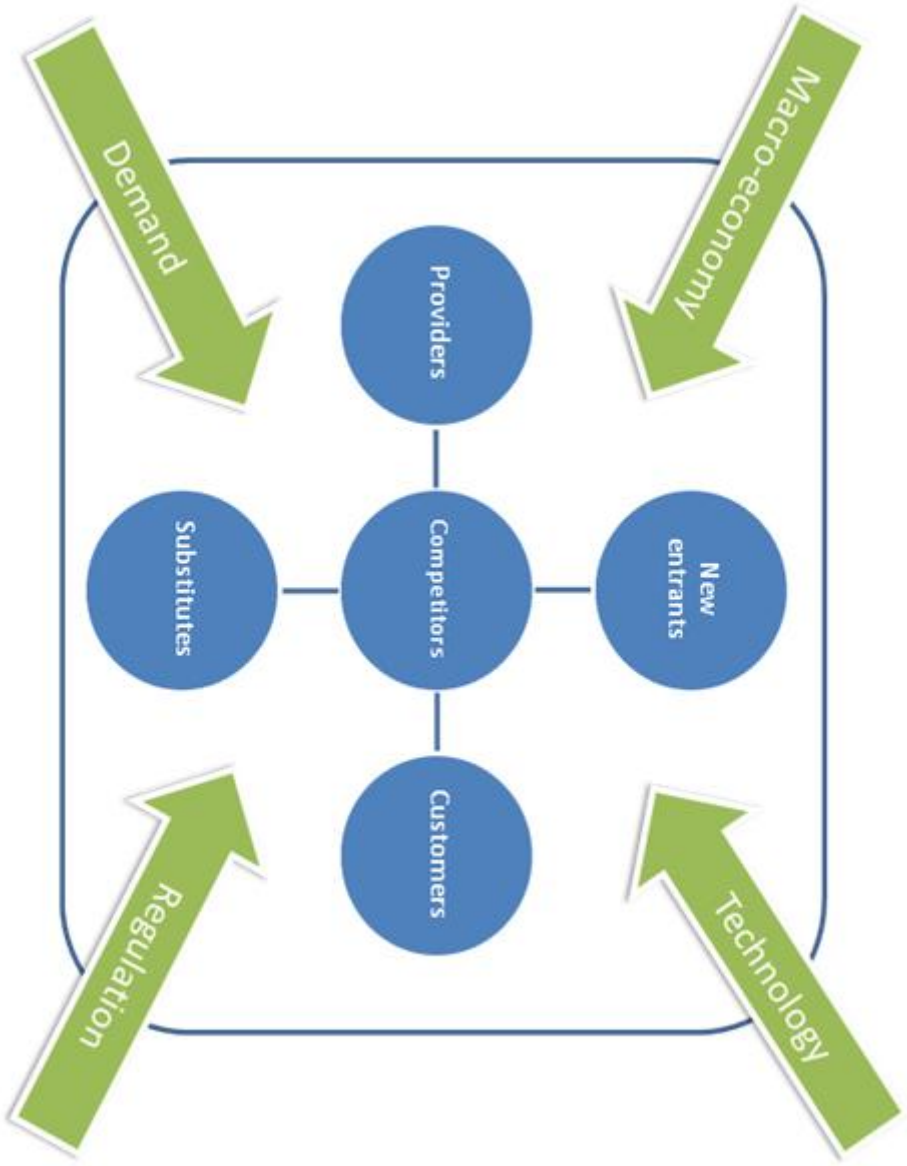

Figure 9.36: Internal and External forces model

Figure 9.37: Segment competitive fit. Andalucía has the highest value

manufacturing. mechanics, etc. Hence, it will be our first target.

Nevertheless, according to the classification, segment 3 and 1 (companies also related to mechanics located either in Madrid or País Vasco), are also good business opportunities. This segments will be our target in the expansion plan. Segments 4,5 and 6 are not as much profitable as segments 1,2 and 3 but they mean an important business too. Finally, segment 7 (companies which main activity is consultancy or engineering and are placed in Aragón and Catalonia) don't represent an opportunity for us.

Once we have selected a segment, we must value the companies within this group. In order to do that, we will analyse the amount of projects they are working on and those on which they will work. For that, we have analysed their current work in progress (WIP) and also the projects that will be ordered to them. Due to segment 1 are companies located in Andalucía, most of their workload will come from Airbus Military, that's the reason why we have analyzed the different orders made from Airbus to them.

As we have seen in the market research section, in Andalucía there exists about 150 aeronautic companies. In table 9.7 (on page 157) we have sorted them by their work in progress (we only show the highest values). This number represents the amount of orders asked by EADS to these companies. By this, we will be able to roughly estimate the number of tooling that they have and the size of the company.

Although it is not shown in the table, Airbus Military also represents an important customer. Actually, after several meetings with them, we have realized that they are trying to implement an RFID solution for their toolings but they don't have the know-how. It means a very good business opportunity as we have explained in the previous chapter of this business plan.

If we perform a new Value-Competitive graph with the Andalusian companies, we realize that we have many opportunities for applying our solution. As we can see in figure 9.40, our main objective is to start working with Airbus Military. Right now, they need a new system to locate all their tools, testing devices, FIFO elements and so on, and they are willing to invest in RFID technology.

The important fact of working with Airbus Military is that once they start implementing RFID technology in their plants, they will start requesting to their providers the same technology. Hence, we would be the best option for the subcontractors as we already know the techonology they are

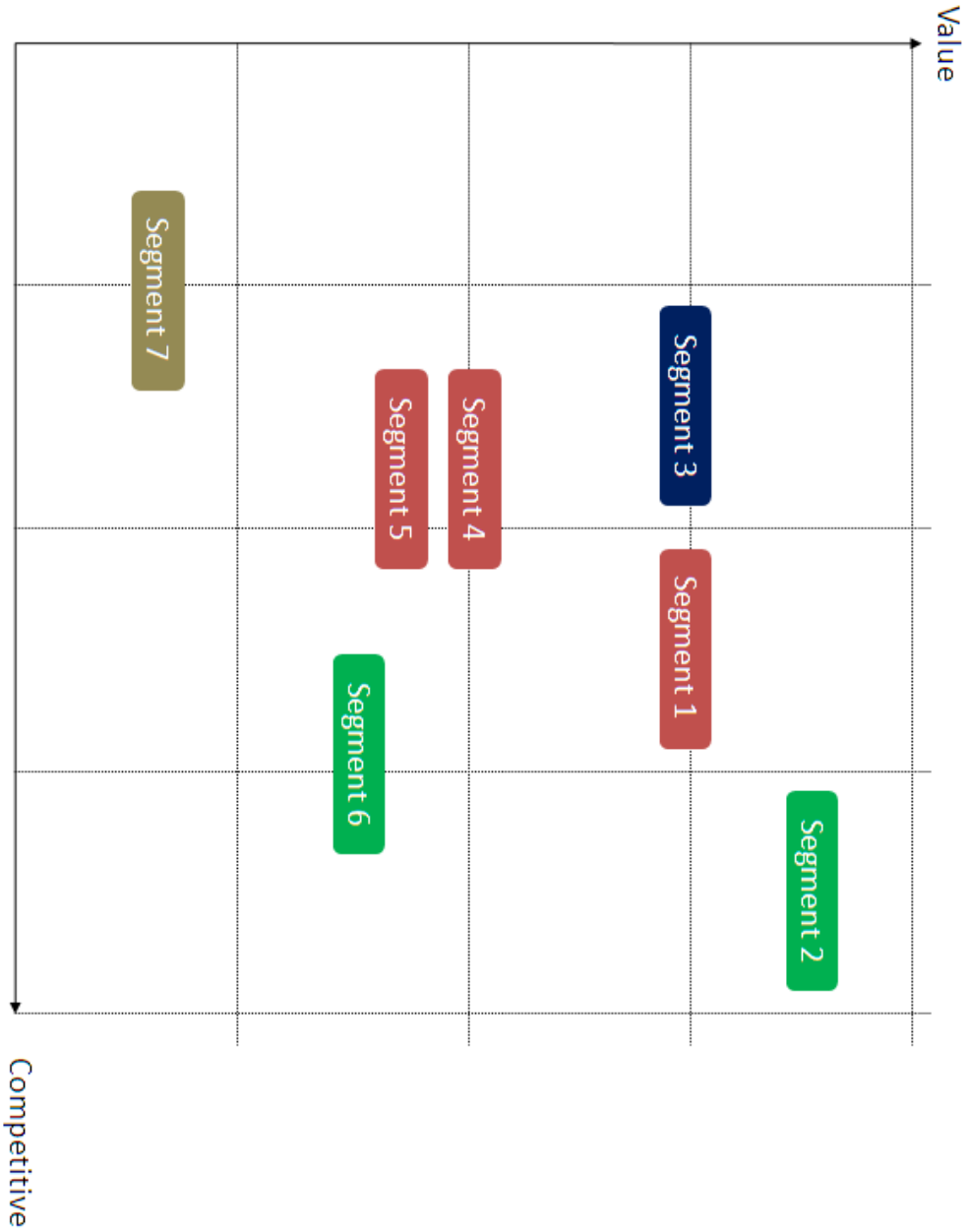

Figure 9.38: Segmentation evaluation

Company	Orders	Future orders
SK10 ANDALUCIA S.A.	2,381	2,127
AERONAUTICA DEL SUR, S.A.L.	1,841	2,443
AIRGRUP SL	1,681	805
SEVILLA CONTROLS A	1,589	852
ELIMCO SOL. INT., S.A.	1,511	140
UMI AERONAUTICA, S.L.	1,165	1,163
MEC. Y MONT. AER. S,A,	1,147	465
INTEC-AIR, S.L.	1,124	654
SOC AND. DE COMP ESP. SA	854	677
SERVIMEC MECANIZADOS SL	817	582
AEROESTRUCTURA SEVILLA, S.L.	788	472
AERONAUTICA CALDERERIA, S.A.	760	2,443
EASY INDUSTRIAL SOLUTIONS SL	602	214
CONSUR, S.A.	543	588

Table 9.7: Top companies in Andalucía by work in procress (February 2010)

working with. Nevertheless, another option could be to get into the market by introducing our product in other companies around Airbus, for example SK 10, Airgrup, Intec-Air, etc. and targeting Airbus Military in the following years.

9.8 Value proposition design

The objective is to design a commercial offer that we are able to bring to the customer and that maximized the value generated by the segment.

The value-delivery sequence is at the core of the new view of business processes, which places marketing at the beginning of the planning process. Instead of emphasizing making and selling, companies see themselves involved in a three-phase value creation and delivery sequence.

The first phase, choosing the value, represents the strategic "homework" that marketing must do before any product exists. The marketing staff must segment the market, select the appropriate market target, and develop the offers value positioning. In the second phase, providing the value, marketers detail the products specifications and services, set a target price, then make and distribute the product. Developing specific product features, prices, and distribution occurs at this stage and is part of tactical marketing. The task in the third phase is communicating the value. Here, further tactical marketing occurs in utilizing the sales force, sales promotion, advertising, and other promotional tools to inform the market about the product. Thus, as Figure 9.42 shows, the marketing process actually begins before there is a product and continues while it is being developed and after it becomes available.

	Competitive Fit
SK10 ANDALUCIA S.A.	
AERONAUTICA DEL SUR, S.A.L.	
AERONAUTICA CALDERERIA, S.A.	
AIRGRUP SL	
SEVILLA CONTROLS A	
UMI AERONAUTICA, S.L.	
INTEC-AIR, S.L.	
ELIMCO SOLUCIONES INTEGRALES, S.A.	
MECANIZADOS Y MONTAJES AERONAUTICOS S,A,	
SOC ANDALUZA DE COMP ESPECIALES SA	
SERVIMEC MECANIZADOS SL	
AEROESTRUCTURA SEVILLA, S.L.	
CONSUR, S.A.	
EASY INDUSTRIAL SOLUTIONS SL	
AIRBUS MILITARY	

Figure 9.39: Competitive fit for aeronautic companies in Andalucía

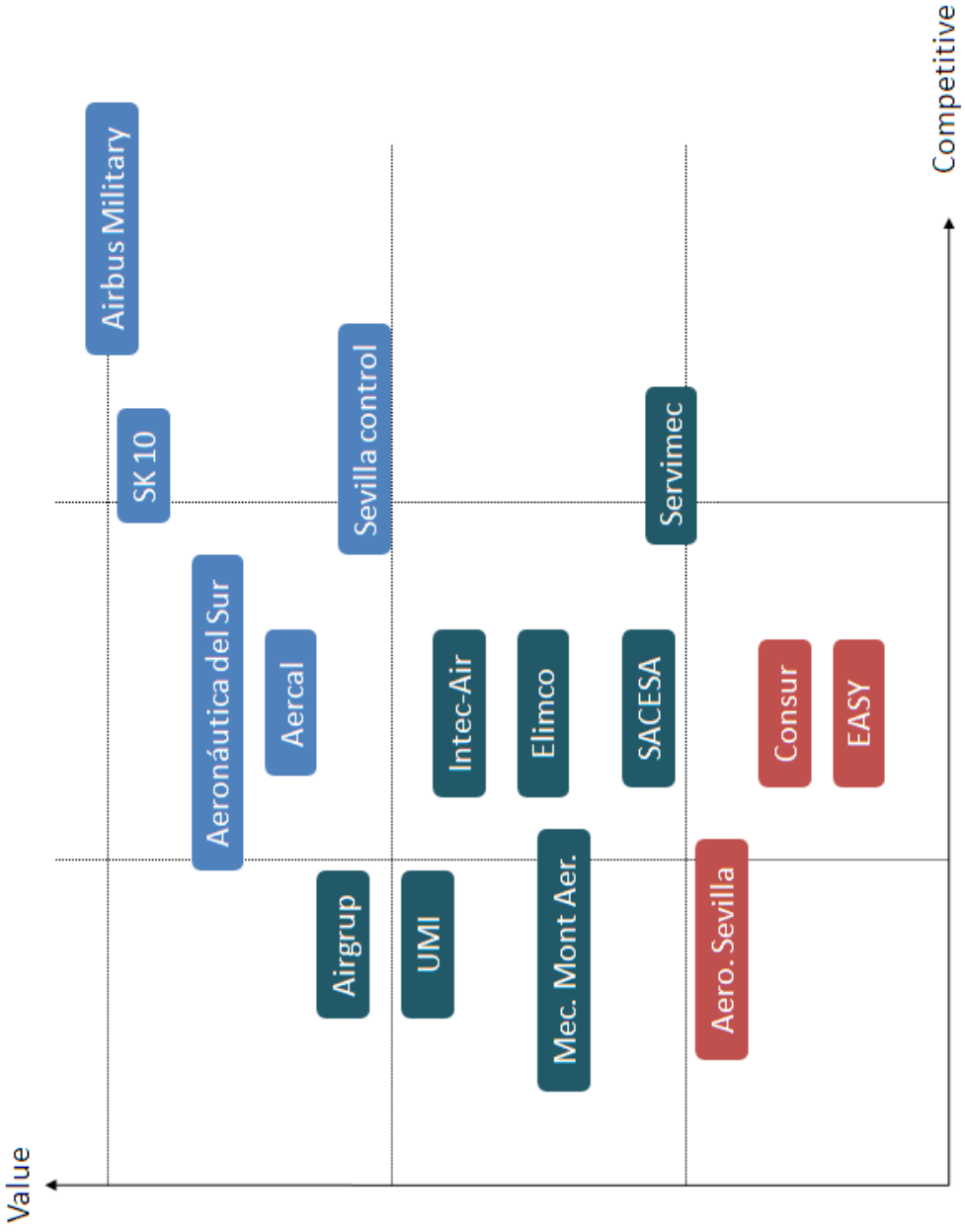

Figure 9.40: Value-Competitive analysis for aeronautic companies in Andalucía

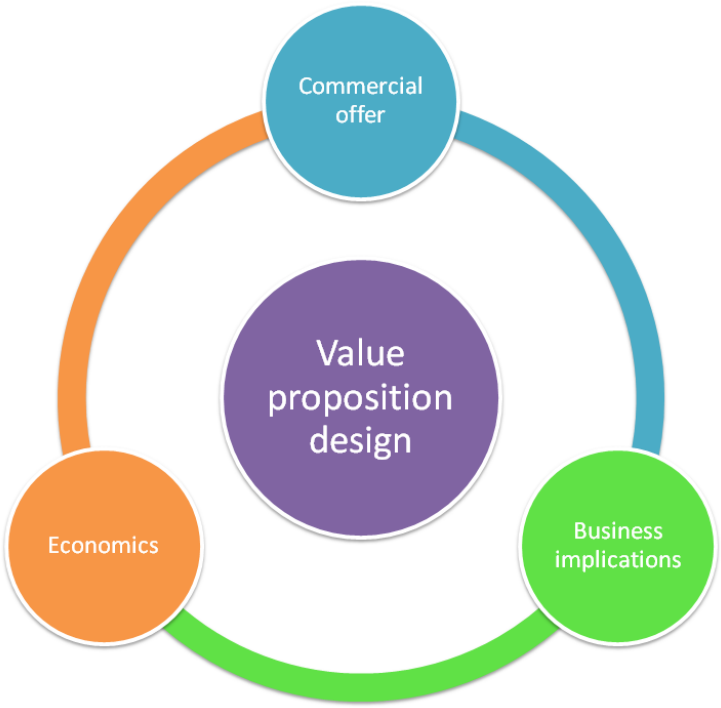

Figure 9.41: Value Proposition Design

9.9 Marketing Mix

Marketing mix is the set of marketing tools that the firm uses to pursue its marketing objectives in the target market. McCarthy classified these tools into four broad groups that he called the four Ps of marketing: Product, Placement, Promotion and Pricing.

Marketing-mix decisions must be made to influence the trade channels as well as the final consumers. Typically, the firm can change its price, sales-force size, and advertising expenditures in the short run. However, it can develop new products and modify its distribution channels only in the long run. Thus, the firm typically makes fewer period-to-period marketing-mix changes in the short run than the number of marketing- mix decision variables might suggest.

Marketing Mix determines the characteristics and positioning of the product and priorizes it. It also define the pricing strategy, structure and manage individual discount and pricing perception. Finally, it helps us to determine the profitability analysis.

We must define each channel roll and expenditure as well by the channel mix. Once we have chosen some channels we must priorize them and define and integrate a strategy.

Regarding the Communication side, we must develop the branding strat-

Figure 9.42: Two Views of the Value-Delivery Process

egy and the brand name/identity selection. The company has to identify the principal barriers and determine the attributes to communicate and execute a communication plan.

9.9.1 Product

As we have explained in the previous chapter, we will analyze the different requirements for the customer and we will provide solutions for each of them.

Initially we will design and develop a standard core system that will be valid to apply to every solution where RFID tags have to be read. This module is called RIM (RFID Identification Management). This will be a basic module, with no specic functionality itself, but being the core of any further possible solution.

Additionally we will develop three extra modules for the differents services: FIFO elements, Asset control module and exportation license products.

More information about these products is explained in the *Product portfolio description* within the Operational Plan.

9.9.2 Placement

In the beginning we will settle our main office in Seville, and we will work with local companies. It is important to point out that, in Seville there are more than one hundred aeronautic companies, hence we have a very good opportunity in this city.

9.9.3 Promotion

We will promote our product by different ways. The main channel will be by visiting the different companies and presenting them how they can perform their productivity with our product. This visit will be made by the Manager of the company and the Commercial agent. Direct contact of entrepeneurs to possible clients is one of the most effective ways to gain them as new customers.

Another channel used to promote our product will be posting reviews about our solutions on the different technical magazines, either aeronautical publications or industrial magazines. We will emphasize the benefits and the improvements that a company can achieve by using our product.

To complement the spreading work of visiting possible customers and review posting, we will do direct call for the different companies placed in

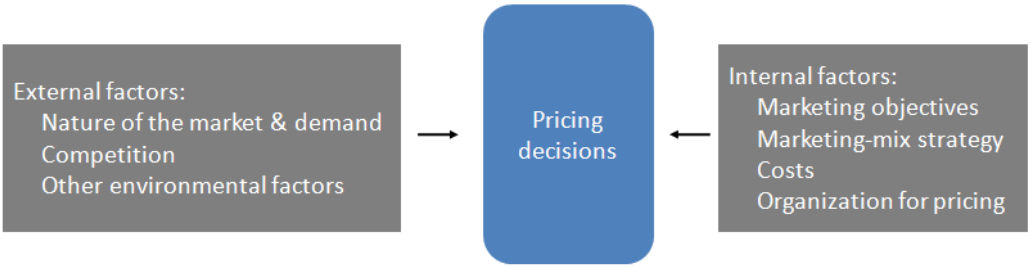

Figure 9.43: Factors affecting pricing decisions

Andalucía. This will be a previous step in order to arrange a meeting with them.

In the same way as the direct call, some direct mailing will be approached. Potential customers will be selected and sent our product portfolio through direct mailing, combining a good competition with an attractive leaflet.

Another posibility to promote our product is by going to different RFID fairs:

- **RFID Journal LIVE! Europe**: October (Frankfurt).
- **MIDAT**: October (Barcelona).
- **RFID Show**: December (Paris).

Finally, we will also develop a website where customers can take a look about RFID technology and its advantages.

9.9.4 Pricing

A company's pricing decisions are affected both by internal company factors and by external environmental factors (figure 9.43).

Internal factors affecting pricing decisions

Internal factors affecting pricing include:.

- **Marketing Objectives**: Before setting price, we must decide on its strategy for the product. If we have selected its target market and positioning carefully, then its marketing-mix strategy, including price, will be fairly straightforward. At the same time, the company may seek additional objectives. The clearer a firm is about its objectives, the easier it is to set price. Examples of common objectives are survived, current profit maximization, market-share maximization and product-quality leadership.

- **Marketing-mix strategy**: Price is only one of the marketing-mix tools that a company uses to achieve its marketing objectives. Price decisions must be co-ordinated with product design, distribution and promotion decisions to form a consistent and effective marketing programme.

- **Costs**: Costs set the floor for the price that the company can charge for its product. The company wants to charge a price that both covers all its costs for producing, distributing and selling the product, and delivers a fair rate of return for its effort and risk. A company's costs may be an important element in its pricing strategy. Many companies work to become the 'low-cost producers' in their industries. Companies with lower costs can set lower prices that result in greater sales and profits.

- **Organizational considerations**: Management must decide who within the organization should set prices. Companies handle pricing in a variety of ways. In small companies, prices arc often set by top management rather than by the marketing or sales departments. In large companies, pricing is typically handled by divisional or product line managers.

External factors affecting pricing decisions

External factors that affect pricing decisions include the nature of the market and demand, competition and other environmental elements.

- **The market and demand**: Whereas costs set the lower limit of prices, the market and demand set the upper limit. Both consumer and industrial buyers balance the price of a product or service against the benefits of owning it. Thus, before setting prices, the marketer must understand the relationship between price and demand for its product.

- **Competitors' cost, prices and offers**: Another external factor affecting the company's pricing decisions is competitors' costs and prices, and possible competitor reactions to the company's own pricing moves. In our case, we will profit the lack of competitors.

- **Other external factors**: When setting prices, the company must also consider other factors in its external environment. Economic conditions can have a strong impact on the firm's pricing strategics.Economic factors such as boom or recession, inflation and interest rate affect pricing decisions because they affect both the costs of producing a product and consumer perception of the product's price and value. The company must also consider what impact its prices will have on other parties in its environment.

Taking in consideration all these posibilities and as we are providing consultancy services providing to our customer a turnkey project, we have decided to estimate the cost of our product by the total hours devoted to each project. In the financial plan there is more information about how we have work out these figures and the sales price in each customer.

9.9.5 Brand

Building a strong brand requires careful planning and a great deal of long-term investment. At the heart of a successful brand is a great product or service, backed by creatively designed and executed marketing.

We define brand as "a name, term, sign, symbol, or design, or a combination of them, intended to identify the goods or services of one seller or group of sellers and to differentiate them from those of competitors." A brand is thus a product or service that adds dimensions that differentiate it in some way from other products or services designed to satisfy the same need. These differences may be functional, rational, or tangible-related to product performance of the brand. They may also be more symbolic, emotional or intangible-related to what the brand represents.

Branding has been around for centuries as a means to distinguish the goods of one producer from those of another. Today it plays a number of important roles that improve consumers' lives and enhance the financial value of firms.

Brand equity is the added value endowed to products and services. This value may be reflected in how consumers think, feel, and act with respect to the brand, as well as the prices, market share, and profitability that the brand commands for the firm. Brand equity is an important intangible asset that has psychological and financial value to the firm.

Although there is agreement about basic principles, a number of models of brand equity offer some different perspectives. Here we briefly highlight four of the more established ones.

Brand Asset Valuator

Advertising agency Young and Rubicam (Y&R) developed a model of brand equity called Brand Asset Valuator (BAV). Based on research with almost 200,000 consumers in 40 countries, BAV provides comparative measures of the brand equity of thousands of brands across hundreds of different categories. There are four key components–or pillars–of brand equity, according to BAV:

- Differentiation measures the degree to which a brand is seen as different from others.

- Relevance measures the breadth of a brand's appeal.
- Esteem measures how well the brand is regarded and respected.
- Knowledge measures how familiar and intimate consumers are with the brand.

Aaker model

Former UC-Berkeley marketing professor David Aaker views brand equity as a set of five categories of brand assets and liabilities linked to a brand that add to or subtract from the value provided by a product or service to a firm and/or to that firm's customers. These categories of brand assets are: (1) brand loyalty, (2) brand awareness, (3) perceived quality, (4) brand associations, and (5) other proprietary assets such as patents, trademarks, and channel relationships.

According to Aaker, a particularly important concept for building brand equity is brand identity, the unique set of brand associations that represent what the brand stands for and promises to customers.Aaker also conceptualizes brand identity as including a core and an extended identity.

Brandz

Marketing research consultants Millward Brown and WPP have developed the BRANDZ model of brand strength, at the heart of which is the BrandDynamics pyramid. According to this model, brand building involves a sequential series of steps, where each step is contingent upon successfully accomplishing the previous step. The objectives at each step, in ascending order, are as follows:

- **Presence**: Do I know about it?
- **Relevance**: Does it offer me something?
- **Performance**: Can it deliver?
- **Advantage**: Does it offer something better than others?
- **Bonding**: Nothing else beats it

Brand resonance

The brand resonance model also views brand building as an ascending, sequential series of steps, from bottom to top: (1) ensuring identification of the brand with customers and an association of the brand in customers' minds

with a specific product class or customer need; (2) firmly establishing the totality of brand meaning in the minds of customers by strategically linking a host of tangible and intangible brand associations; (3) eliciting the proper customer responses in terms of brand-related judgment and feelings; and (4) converting brand response to create an intense, active loyalty relationship between customers and the brand. According to this model, enacting the four steps involves establishing six "brand building blocks" with customers.

Chapter 10

Strategic Objectives

10.1 Introduction

The company will have a strategy of excellence in the aeronautical sector, a key sector in Andalusia and Spain, opting for the quality of its services.

The company will continuously grow year by year but stable, showing particular attention in maintaining an excellent service to the customer and a financial balance of the company.

AIRFID S.L will pursue these strategic objectives through positioning, sales and profitability.

10.2 Position Objective

RFID is an emerging technology with a strong emerging market where the competition in our sector is almost non-existent, so we must take advantage of this situation and reach a good position in medium-long term, to enable us to have an acceptable level of income and to create a barrier for new competitors. Hence, the strategic objective for positioning our company is to have the 40% of the total market share in Andalusia in the fifth year of operation.

The geographical area where we will focus our activity is Andalusia, more specifically in Seville and Cádiz, where the aeronautical activity is more active than in the rest of Andalusia. Nevertheless, our expansion plan foresees the possibility of extending our business to the rest of Spain, where the report "2008-2016 Strategic Plan for the Spanish Aeronautic Sector" [37] predicts an enormous growth for the following years.

Our target clients will be companies belonging to the aeronautical sector with a need of locating their assets. Additionally, as it will be explained

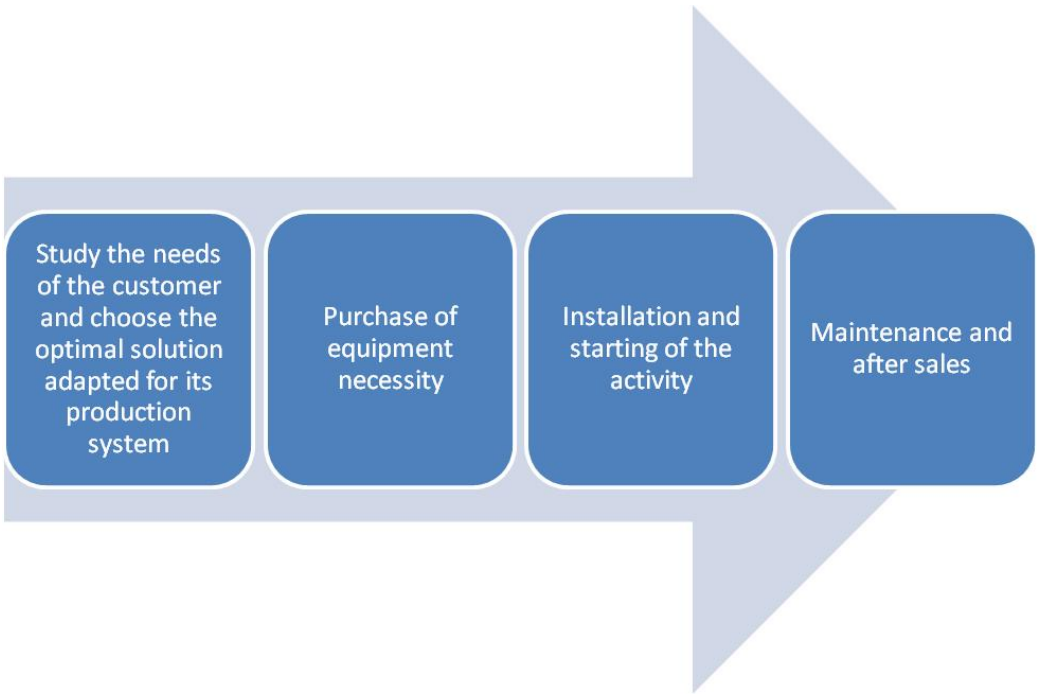

Figure 10.1: Customer Implementation Process

in the Expansion Plan, AIRFID S.L. will have a long term expansion line focusing on other sectors.

The product provided by AIRFID S.L. will seek to cover all the customers' needs. It will consist of a "turnkey project" that will cover from the technical aspect to the solution and the implementation. The process will be made up by the services shown in Figure 10.1.

The aim of ARFID will be to increase the productivity and the efficiency ouf our customers and to decrease their costs.

We foresee that several competitors will appear in a short run, so we must develop strategies to keep our strategic position competing through price and quality.

According to all these objectives and taking into account the special feature that our company is going to work with a cutting-edge technology and that it will be the first company in offering this services in the aeronautic sector in Andalusia, we think that AIRFID will be positioned in the market as a leader company.

10.3 Sales Objective

The future of the company is subjected to achieve a certain amount of projects, so AIRFID S.L. will need to concentrate its efforts in order to sell a

minimum number of projects given that it is a key factor for the sustainability of the company.

To determine this objective we have to analyze the potential sales, which are described in the Marketing Analysis. After this, we have made an estimation of its evolution over time (5 years).

As described in the Market Research section in Chapter 9, the potential market for RFID is quite wide and in consequence it is very difficult to establish the potential sales as a percentage (market share) of the potential market.

After having analyzed the sector it has been estimated that in a five years period AIRFID will reach a level of sales higher to the average sales of other RFID companies in other sectors, which is 1 million€.

AIRFID sales objetive will be around 1.5 million € in the fifth year of operation.

10.4 Profitability Objective

Another key factor is the profitability. AIRFID will focus on obtaining a high profitability of its activities. The way to do that will be by reducing operating costs and being more efficient.

Since the average profitability (ROE) of the sector for RFID companies is around 12-16% [30], AIRFID will seek an average profitability at least around 15%.

Finally, given the fact that the average Return On Investment (ROI) of the companies in the RFID sector is around 8.13%, AIRFID will try to reach a ROI of 12% at least.

Chapter 11

Operational Plan

11.1 Estimated operational planning

In this chapter, we will show an estimation of the works to develop during the first three years of operation of AIRFID S.L. Of course, we have to consider that this is only an approach to what we estimate could be our workload during this period, that depends not only on our performance, but also on many external factors such as the economic environment, competitors, and mainly the customers situation. Figure 11.1 on page 174 shows the estimated planning.

At the very beginning, the first efforts will be focused on understanding the customers needs, agreeing potential solutions with them, and getting their commitment towards a future product, that will be started to develop as soon as possible.

11.2 Facilities and initial equipment

Airfid S.L. will count from the first moment with a rented office in Av. Jose Galan Merino, in Seville. That address is also the legal address for the company, as the legal plan explains.

This office has a surface of 45m^2, and presents a unique division, that splits the space in two parts, one of 10m^2 and the other of 35m^2. That space is considered to be enough for at least two years of operation of the company according to the expected needs of workforce for that period. The office has WC, air conditioning installation, and phone and internet services. The monthly rent for that office is 350 per year including VAT.

We will use the 10m^2 room as a meeting room, where we can receive customers and hold meetings among the different departments. The rest of the room will be shared by all the departments, and will dispose of at least

	Year 1				Year 2				Year 3			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Potential customers - data collection												
Basic module (RIM) definition, design and develpment												
ACM specific module definition, design and development												
RIM debugging and adjustments												
ACM debugging and adjustments												
ELM specific module definition, design and development												
FPM specific module definition, design and development												
ELM integration and testing												
FPM integration and testing												
New products definition												
Proposals presentations to target customers/negotiation												
First contract sign on												
First contract development												
First contract guarantee												
Second contract sign on												
Second contract development												
Second contract guarantee												
Third contract sign on												
Third contract development												
Third contract guarantee												
Fairs participation												

Figure 11.1: Three-year estimated planning

ten job positions, each one of them with a table and drawers. There will also be shared shelves in the office.

Regarding the communications, each one of the employees of the company will dispose of a mobile phone with the possibility to access to the internet.

Besides the general equipment of the office, each department will be assigned specific resources, which are explained in the corresponding part.

The general equipment is expected to be enough for at least the first two years, while the specific equipment will be more variable depending on the workload.

The initial amount invested in general equipment as well as all the costs incurred monthly in the company is shown in the financial plan, according to all the data explained through this operational plan.

11.3 AIRFID S.L. organization chart

In this paragraph we will show the organization chart of AIRFID S.L. We consider two different organizations that will be needed along the company´s start, in order to optimize the resources at any moment. First, the company will start without customers and without developed products. That obliges to focus all the effort in the commercial and design departments, in order to reach as many customers and contracts as possible and to design and develop the products as quick as possible. The second type of organization starts when the company gets the first contract. In that moment a production department becomes necessary, in order to assume new responsibilities

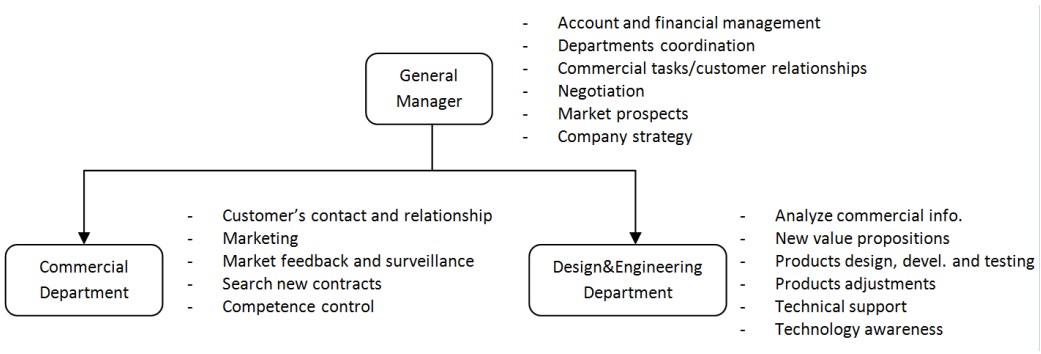

Figure 11.2: AIRFID S.L. initial organization chart

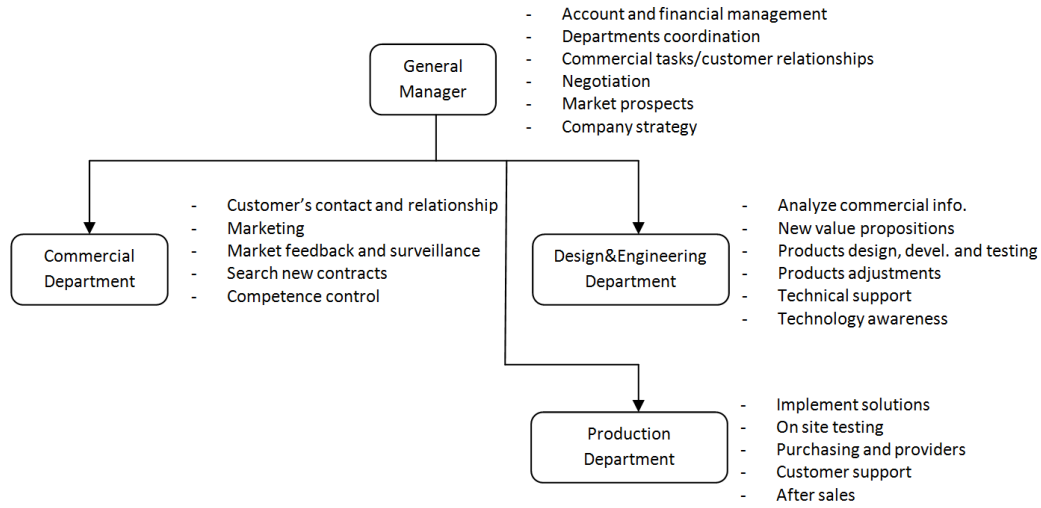

Figure 11.3: AIRFID S.L. organization chart including production department

and carry out new tasks in the company, such as procurement and services deployment.

Figure 11.2 shows the company´s organization chart for the first months, and will be applied until the moment in which the first contract is signed.

Figure 11.3 shows the company´s organization chart since the moment when a first contract is signed.

11.4 General Manager Position

The general manager of the company is the position responsible for the overall company performance and evolution.

This position will be held by one of the shareholders of the company, as explained in the Human Resources chapter, and will be designated in the first shareholders meeting.

The main responsibilities of the general manager are the following:

- To determine and establish, beside the managers of the departments, the company´s vision, mission and general strategic objectives of the company.
- To establish strategic actions for the whole company and for each department, coordinating these actions and agreeing them with the managers of each one.
- To coordinate the different departments in order to reach a common objective without deviating from the companys vision.
- To supervise the results of each department periodically, monitoring deviations respect to the plans, and applying corrective actions when needed.
- To manage the finances of the company and look for new funds when needed, negotiating with banks and new possible investors.
- To manage the companyś accounts (internally or externally) and search for the best formulas for the company at any moment.
- To manage every legal aspect that could appear.
- To help in negotiation processes either with customer or suppliers.
- To support the commercial department with strategic customers or specific situations.
- To represent the company´s image and interest.
- To define the planning for the company in the short term, and provide the necessary resources to accomplish it.
- To survey the market and search for new possible customer, opportunities, threats, substitutes, competitors and analyze associated risks or possibilities.
- To keep abreast of the latest technologies and economic outlooks.

The general manager of the company will dispose of a laptop as well as a mobile phone.

11.5 Design and Engineering Department

11.5.1 Product portfolio

AIRFID S.L. will be born to cover a specific demand of specialized RFID solutions in the aerospace sector during the first years of life. Of course, if

the company succeeds, an expansion plan to other sectors and regions will be carried out.

With this idea in mind, during the process of products creation in the company,it's very important to analyze, how standard these products can be, in order to optimize the results of design and development phases and to be able to apply the solutions as widely as possible.

Hence, AIRFID S.L. will design and develop a standard core system that will be valid to apply to every solution where RFID tags have to be read. This will be a basic module, with no specific functionality itself, but being the core of any further possible solution.

Basic Module

Figure 11.4 on page 178 shows the process to follow in the creation of the basic standard module.

The multidisciplinary team will be formed by members of the design and the commercial departments of the company, as well as the production department as soon as this is created according to this operational plan of the company. This basic module will be the first job to develop by the design and engineering department. Once the basic module is developed, it will serve as the core tool for the rest of complementary modules. This basic module will be called RIM (RFID Identification Management).

The main components of this module will be:

1. **Software**. Is the core tool of the solution, and where design and development efforts will be almost fully concentrated, as the rest of the parts (readers, tags) will be bought in the market. The main functionalities of the software will be:

    - Capabilities to work bi-directionally with a wide variety of commercial tag readers (although in the aerospace sector we will work with UHF Standard Gen2, its desired to make the application as general as possible). Receive data from the reader and send data to it.
    - Capabilities to work with a wide variety of commercial tag printers.
    - Capabilities to work with the most common O/S platforms (Windows, Mac OS).
    - Database storage of the readings.
    - Database updating according to readings.
    - Database management to filter, order, edit and extract specific data.

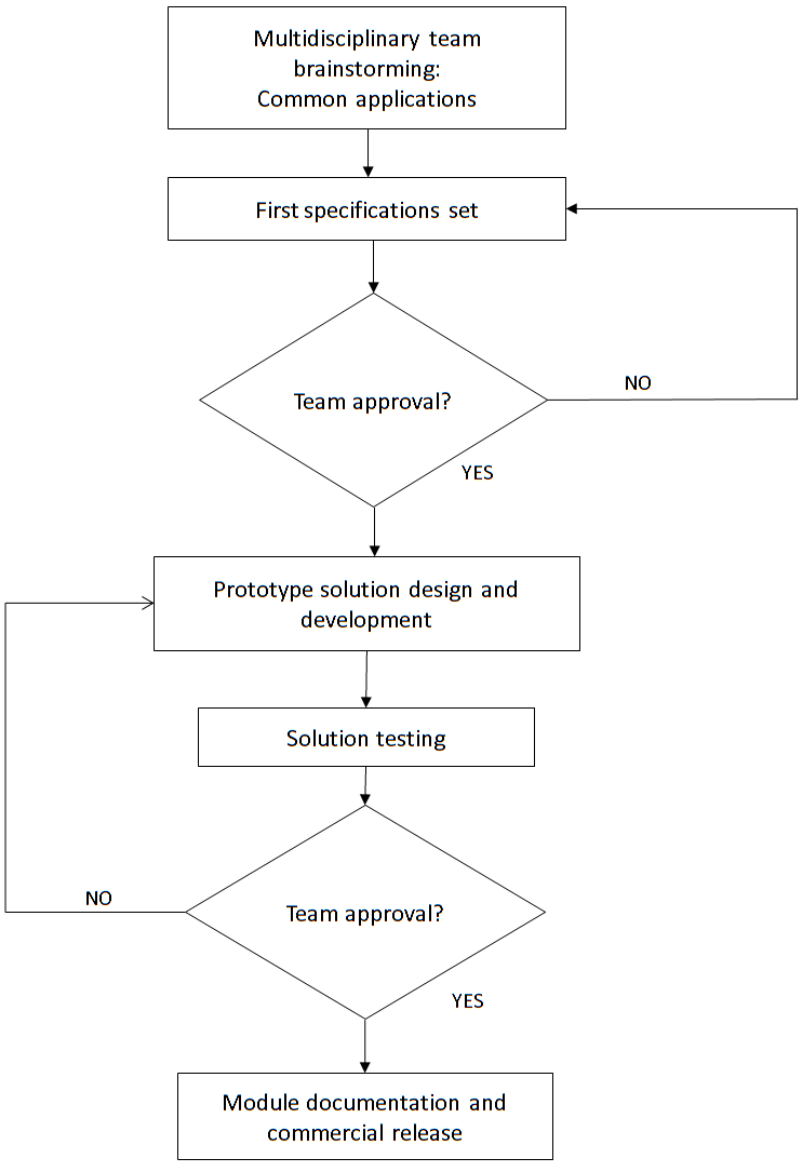

Figure 11.4: Basic Module design process

- Visual environment displaying database functionalities and external devices such as readers and printers interface options.
- Capability to work integrated besides SAP.

2. **Readers**. Any specific application will need at least one reader. As this item will not be developed by us, but bought in the market, we will offer a wide variety of them in our hardware product portfolio, in order the customer to select the one that, with our technical support, he decides is the best he can select. The readers will always have the possibility to work as single, multiple or dense (DMI) interrogator, and will be selected amongst the best available in the market, regarding power consumption, robust, and speed. Every reader bought will have its corresponding certification, as a requirement of the quality system

of the company.

3. **Printers**. This item could be or not necessary in a specific project. As this item will not be developed by us, but bought in the market, we will offer a wide variety of them in our hardware product portfolio, in order the customer to select the one that, with our technical support, he decides is the best he can select. They will be selected amongst the best available in the market, regarding power consumption, robust, and speed, and all the printers offered will come with its corresponding certification.

4. **Tags**. This is a key component in every project. Depending on the specific application to satisfy, some parameters will change:

   - Amount of memory (in bits)
   - Active/passive tag
   - Data retention time
   - Write/erase cycles
   - Metal mount tag/standard tag
   - Tag size
   - Operating temperature

Although in applications related to aerospace, most of these characteristics will be homogeneous, varying mainly the amount of data to store, tag type (active/passive), base (metal mount or standard) and size. Other characteristics such as the standards to accomplish with will be always the same: EPC Gen 2 and ISO/IEC18000-6c. Further technical information can be found in the specific section destinated to equipment.

In Table 11.1 is shown the number of hours needed to develop this basic module. This table includes the hours dedicated to the design, development and testing.

Specific Modules

As the company starts to get in touch with the customers, their needs will start to create the appropriate environment to develop specific modules. These needs must be registered by the commercial department and analyzed by the multidisciplinary team. The main objective is to completely understand the needs of the customers and being able to develop under a contract, a solution that must be valid to as many potential customers as possible, thus creating modularity in the products.

These specific modules will always run around the basic module, complementing the software performance and adding the desired specific functionality to the tool.

Phase	Category	Concept	Number hours	Percentage
PREANALYSIS	Specifications	Requirements analysis	80	10%
	Data Structure	Computer software database	40	5%
		Computer data structure	50	6%
		RFID reader data structure	40	5%
		RFID tags data structure	40	5%
DESIGN	Architecture	Structure's interface	20	2%
	Interface	Usability	30	4%
		Interfaz software PC	25	3%
		Interfaz lector	15	2%
	Communications	RFID tag-reader protocol	50	6%
		RFID reader-pc protocol	40	5%
DEVELOPMENT	Source code framework	Procedures, functions and classes	80	10%
	Integration	PC Software	100	12%
		RFID reader	40	5%
		RFID tags data structure	30	4%
	Communications	RFID tag-reader protocol	40	5%
		RFID reader-pc protocol	40	5%
TESTING	Interface	Computer software interface	12.5	1%
		RFID reader interface	5.5	1%
	Communications	RFID tag-reader protocol	9	1%
		RFID reader-pc protocol	8	1%
	General	Complete software verification	40	5%

Table 11.1: Design hours for basic module

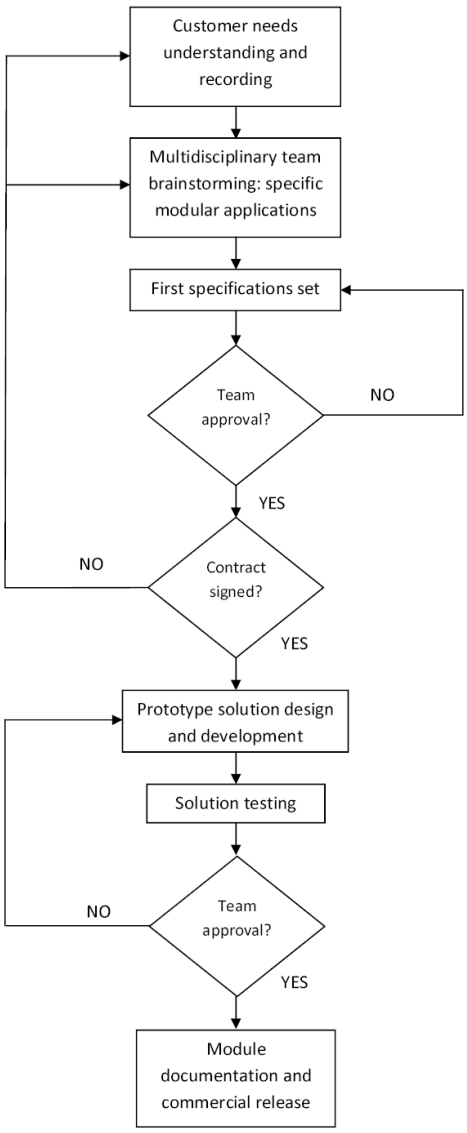

Figure 11.5: Specific Modules design process

The following chart shows the process to create specific software modules:

A preliminary study on the needs of our target customers has revealed that AIRFID S.L. efforts should focus in a very first moment in developing three potential modules, which will count on an interesting acceptance among the market:

- **Asset Control Module (ACM)**: This module will allow controlling a set of assets that are critical in the customers processes. The objective of this module is to reduce significantly searching and inventory-making times, which represent an important waste for the company as well as a loss of productivity of those persons who search for a specific assets and spend time on that. With this tool, the customer might be able to have, amongst others, the following functionalities:

  - Read nearby selected tags in order to locate a specific asset. By searching the asset in a database and selecting it, the user could read only the tag associated to this asset, thus reducing significantly the time to locate it, and as a consequence, reducing unproductive searching time.
  - Inventory tool. This tool will permit the user to quickly record the data of all the tagged assets, creating an asset inventory database. When the time to do inventory comes, the procedure is very simple: pass the reader near the assets of your facility and just present the data on a PC screen. By comparing the stored last inventory and the new one, the customers knows at a glance what are the differences.
  - Last read tool. If a desired asset is not found, we can easily find the trace of the reads in order to know when the last read was, and optionally where it was read for the last time. Also, additional information could be added according to customer needs.

- **FIFO Parts Module (FPM)**: This module will allow the customer to easily control all these parts in the warehouse that have expiry date. The problem with these products is that frequently, the products are not managed using the FIFO method, and that means that the process to use them in the manufacturing process is not the optimum. As a result many products pass their expiry date and thus, they become useless, with the consequent loss of money and problems regarding the time to ask for new parts and waiting for them, when it could be part of a critical process. With this module, the customer could be able, amongst other functionalities, to do the following:

  - Record tags in order to store the data related to a product. This data will be, at least, the part number, date of arrival and expiry date.
  - Create a database, linked to SAP (or other ERP tool) in which easily visualize and manage the data related to all this kind of products in the warehouse.
  - Introduce the P/N of a desired part and activate the individual search. The tool will identify automatically the parts to use, according to the expiry date of the oldest one, allowing using the warehouse in a FIFO way.
  - Provide alert messages when a part is about to reach the expiry date, and also provide reports of the parts sorted by expiry date.

- **Export License Module (ELM)**: This module will allow the customer to easily control all these parts that require to be installed in the aircrafts of one specific customer (country, in the military sector) as these parts are sold under an export license agreement, specific for that country. These parts are usually high-tech security parts. The use of these parts is typical in Final Assembly Lines (FAL) as for example those of Airbus Military. The problem with these parts is to control

exactly where they are installed. Since there´s not up to this moment a reliable way to identify them (except looking the serial number, which can induce human errors) confusions can happen and the part could be mounted in a different aircraft. This module may allow the customer, amongst other functionalities, to do the following:

- Record tags in order to store the data related to a product. This data will be, at least, the part number, serial number, end customer and end aircraft identification.
- Create and manage a database, linked to SAP (or other customer ERP tool), including all the part with export license registered at that moment, with the flexibility to filter, order, or create reports of specific parts.
- Search a specific P/N by introducing it in the system and executing an individual search.

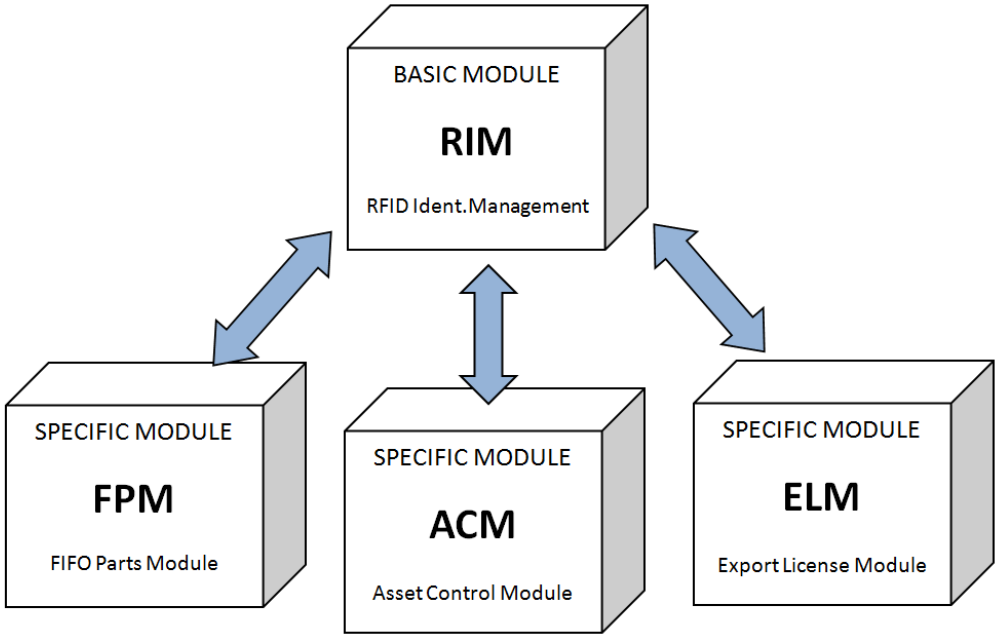

Figure 11.6: Basic and specific modules

In tables 11.2, 11.3 and 11.4 are shown the design hours for the different modules.

11.5.2 Responsibilities

The main responsibilities of the Design and Engineering Department of AIRFID S.L. are the following:

- To record and analyze all the information coming from the commercial department regarding the products or equipment that we offer to the customers.

Phase	Category	Concept	Number hours	Percentage
PREANALYSIS	Specifications	Requirements analysis	32	10%
	Data Structure	Computer software database	16	5%
		Computer data structure	20	6%
		RFID reader data structure	16	5%
		RFID tags data structure	16	5%
DESIGN	Architecture	Structure's interface	8	2%
	Interface	Usability	12	4%
		Interfaz software PC	10	3%
		Interfaz lector	6	2%
	Communications	RFID tag-reader protocol	20	6%
		RFID reader-pc protocol	16	5%
DEVELOPMENT	Source code framework	Procedures, functions and classes	32	10%
	Integration	PC Software	40	12%
		RFID reader	16	5%
		RFID tags data structure	12	4%
	Communications	RFID tag-reader protocol	16	5%
		RFID reader-pc protocol	16	5%
TESTING	Interface	Computer software interface	5	1%
		RFID reader interface	2.2	1%
	Communications	RFID tag-reader protocol	3.6	1%
		RFID reader-pc protocol	3.2	1%
	General	Complete software verification	16	5%

Table 11.2: Design hours for assets control module

Phase	Category	Concept	Number hours	Percentage
PREANALYSIS	Specifications	Requirements analysis	28	10%
DESIGN	Data Structure	Computer software database	14	5%
		Computer data structure	17.5	6%
		RFID reader data structure	14	5%
		RFID tags data structure	14	5%
	Architecture	Structure's interface	7	2%
	Interface	Usability	10.5	4%
		Interfaz software PC	8.75	3%
		Interfaz lector	5.25	2%
	Communications	RFID tag-reader protocol	17.5	6%
		RFID reader-pc protocol	14	5%
DEVELOPMENT	Source code framework	Procedures, functions and classes	28	10%
	Integration	PC Software	35	12%
		RFID reader	14	5%
		RFID tags data structure	10.5	4%
	Communications	RFID tag-reader protocol	14	5%
		RFID reader-pc protocol	14	5%
TESTING	Interface	Computer software interface	4.375	1%
		RFID reader interface	2	1%
	Communications	RFID tag-reader protocol	3.15	1%
		RFID reader-pc protocol	2.8	1%
	General	Complete software verification	14	5%

Table 11.3: Design hours for export license module

Phase	Category	Concept	Number hours	Percentage
PREANALYSIS	Specifications	Requirements analysis	36	10%
	Data Structure	Computer software database	18	5%
		Computer data structure	22.5	6%
		RFID reader data structure	18	5%
		RFID tags data structure	18	5%
DESIGN	Architecture	Structure's interface	9	2%
	Interface	Usability	13.5	4%
		Interfaz software PC	11.25	3%
		Interfaz lector	6.75	2%
	Communications	RFID tag-reader protocol	22.5	6%
		RFID reader-pc protocol	18	5%
DEVELOPMENT	Source code framework	Procedures, functions and classes	36	10%
	Integration	PC Software	45	12%
		RFID reader	18	5%
		RFID tags data structure	13.5	4%
	Communications	RFID tag-reader protocol	18	5%
		RFID reader-pc protocol	18	5%
TESTING	Interface	Computer software interface	5.625	1%
		RFID reader interface	2.475	1%
	Communications	RFID tag-reader protocol	4.05	1%
		RFID reader-pc protocol	3.6	1%
	General	Complete software verification	18	5%

Table 11.4: Design hours for FIFO parts module

- To provide technical support to the commercial department when needed, also in the case of customers that need a special attention from the technical point of view.
- To create value propositions beside other areas of the company such as commercial or production, in order to create new products suitable for the market and according to the modular design philosophy of the company.
- To design and develop those product propositions that pass the approval of a multidisciplinary team in the company. This development phase will always be directed by achieving the best results for our customers with the best quality and the lowest possible cost and development time for us.
- To test the newly developed products.
- To provide technical support to the production department when needed during the installation of a solution to a customer.
- To keep abreast to the market news, improvements, trends and state-of-the-art technology regarding the technical applications and the hardware, and give advice of that to the rest of the company through the general manager.

Beside all these responsibilities, this department, as well as the others, will be subject to a changing environment, which requires flexibility and a continuous communication and help among the different areas of the company, something that shouldnt be difficult to do due to the small size of it.

11.5.3 Objectives

Design and Engineering Department plays a key role in the success of the company. Its objective for the first year of operation is simple and clear: to completetely design, develope, test and document RIM basic module and ACM specific module, making them fully available to be introduced in the market with plenty guaratee of performance.

For the second year of operation, this department must accomplish the following objectives:

- During the first half of the year, to completetely design, develope, test and document FPM and ELM specific modules, making them fully available to be introduced in the market with plenty guaratee of performance.
- To create at least 20 new value propositions, from which the new products to develpe will be taken.

The propositions will be made according to the information gathered in multidisciplinary teams brainstorming, paying special attention to the customer feedback from the commercial department.

11.5.4 Assigned resources

Because of the importance of this department, it will be assigned the following specific resources until the moment the first contract is signed on:

- Three design engineers, specialized in RFID, with great knowledge of that technology.
- Three development platforms, that will be composed of:
  - PC with enough features.
  - Development software license.
- Applications testing equipment:
  - Two top-class fixed readers.
  - Two top-class portable readers.
  - One tag printer.
  - Eigth antennas.
  - Supplies for tags of at least three manufacturers, in the required quantity at any moment, and with different capabilities.

This department will be placed at the same facilities that the rest of the company, in the office it has in Seville.

When the first contract is signed, one of the design engineers will leave this department to start and be responsible of the Production, Procurement and After Sales Department.

It´s expected that, as new workload enters the company, more workforce will be needed. During the first year, and with the expectation of an amount of 1 to 3 contracts, could be necessary to hire one more design engineer, in the regime of trainee in order to not increase excessively the costs.

11.5.5 Operatinal planning

In the general planning for the company, we can see an estimation of the activities to carry out in the Design and Engineering Department for the first months of life of the company. As we can see, the first task is to completely define, design, develop, document and test the basic module that will serve as core for the rest of the modules. Regarding the specific modules, ACM

module is expected to be the first to develop, due its relative importance against the other modules for our potential customers. Once this module has been developed, integrated with RIM module, and tested, we will be in the right position to deploy the solution in the customers facilities and start the application debugging and adjustments. If the product works properly and is able to show positive results from the very beginning, we expect to start the other two initial modules (FPM and ELM), following identical sequence than the previous one.

11.6 Commercial Department

11.6.1 Responsibilities

AIRFID S.L. commercial activity will be carried out by the Commercial Department. This department will be, as the organization chart shows, directly dependent of the general manager and will be the main responsible for the selling process.

The main responsibilities of the commercial department are:

- To contact potential customers in order to present them our company and its products/services.
- To contribute to create an image of the company according to the company vision and strategy.
- To detect uncovered necessities of our potential and existing customers.
- To encourage the creation of new necessities in our customers that can benefit both our company and them.
- To provide complete technical support to the customers when they are deciding about buying our products/services.
- To prepare Commercial Offers/Proposals to our customers, being always loyal to the customerś needs.
- To negotiate contracts with the customers, and sign them on.
- To survey the markets, searching for new possible competitors or substitutes.
- To provide the other departments with relevant information from the customers/market.
- To create and manage the product portfolio, in collaboration with the rest of departments.

- To create and manage the marketing strategy of the company, according to the general strategic objectives of the company as well as the Vision and Mission.
- To prepare and manage possible participations in fairs, events, etc.
- To be the face of the company in the market, thus, being completely aligned with the company standards, objectives and vision.
- To manage the CRM (Customer Relationship Management) of the company.

11.6.2 Objectives

In the short term, AIRFID strategic objective is to be positioned as a RFID technology consultant and software developer of aeronautic applications and to reach at least 4 customers of those selected as the target in the Marketing Plan. Reaching Airbus Military would be a great step, as it opens the door to many other smaller companies.

With that idea in mind, short term objectives (for the first year of operation) for the commercial department are as follows:

- To contact and create a customer book with at least 20 potential customers from those selected as potentially more profitable in the marketing plan to show them our products/services under development phase and get feedback from them. That feedback must be discussed in interdepartmental weekly meetings.
- To win contracts by one of the following ways:
  - At least 2 customers (out of the 20 mentioned) worth at minimum 450.000€.
  - If Airbus Military is not one of these customers, contracts worth at minimum 500.000€.
- To visit regularly (at least 3 times during the year) to potential customers (from the previously visited) and comment them about our winning projects or new customers.
- To maintain a continuous communication with the customers wined, with no more than 2 weeks time between each contact.
- To prepare and manage AIRFID S.L. presence at, at least, one national industrial fair of reputed background.

And midterm objectives (1 to 2 years) are the following:

- To contact at least new 30 customers, according to the marketing plan, and eventually outside the Andalusian region. The customers must still be from the aerospace sector.
- To win contracts in some of the following ways:
  - At least 4 customers (out of the 20+30 mentioned) worth at minimum 800.000€.
  - If less than 4 customers, contracts valued at 900.000€.
- If Airbus Military was not won as a customer during the past year, to sign a contract with them.
- To visit regularly (at least 3 times during the year) to potential customers (from the previously visited) and comment them about our winning projects or new customers.
- To maintain a continuous communication with the customers wined, with no more than 2 weeks time between each contact.
- To prepare and manage AIRFID S.L. presence at, at least, two national industrial fair of reputed background.

11.6.3 Structure and assigned resources

AIRFID S.L.'s Commercial Department will be composed by one person being the figure of commercial director, during at least the first year of operation of the company, as resources are very limited. This person will be in charge of the responsibility of this department and will report directly to the general manager.

The Commercial Department will be one of the company shareholders, and will be selected in a shareholders meeting. This person will have a technical profile, with high communication skills, and great knowledge of the RFID and aerospace markets.

Due to the natural limitations of the company at the beginnings, the general manager of the company will also help, whenever possible, in commercial tasks, mainly customers visits and contracts negotiations, always in coordination with the commercial director.

The Commercial Department will be assigned the following resources to work:

- Mobile phone, with access to the internet.
- Laptop, with O/S under Windows license.
- USB modem to connect to the internet whenever and wherever needed.

- Renting car.
- Payment of oil bills related to work.

11.6.4 General selling procedure

Figure 11.7 on page 193 shows the general procedure to follow during the selling process in AIRFID S.L. commercial operations.

Commercial Department is responsible for the whole selling process, since the first contact with the customer, to the end of the project and later.

The Commercial Department will be involved in the specifications settings besides the customer, and will transmit these specifications in a multidisciplinary team meeting, in order to reach a consensus in the technical offer, that will allow him to prepare a economical offer. That offer, as the company is small, will be presented and approved by the team. Once that approval is got, he will present that proposal to the customer, and will negotiate it, with the help of the general manager if needed, until he gets a positive and reasonable agreement. With a signed contract, the final set of specifications will be transmitted to the design and development department, which besides the production department will take the control over the project and implement it in continuous communication with the customer. From that moment, the commercial director obligation is to follow-up the development of the project, and maintain regular contacts with the customer, transmitting and analyzing any possible feedback.

Once the project has finished, the contact must be maintained with the customer, although more spaced in time, to get feedback from our products/services and his satisfaction respect to it.

11.6.5 Operational planning

The first chapter of this operational plan shows an estimation of the expected company operations for the first three years.

During the first months, the Commercial Department must prepare a preliminary product portfolio and all the associated media necessary in order to visit potential customers for the first time and provide them with the necessary information in order to completely understand our products/services and everything than we can offer them. The visits to the customers must be useful to get information about the market/customers needs, and thus, to refine our standard modules design jointly with the Design and Engineering Department.

Once the needs of the customers are analyzed, its expected that in the third month, at least 3 offers are presented to the most relevant customers,

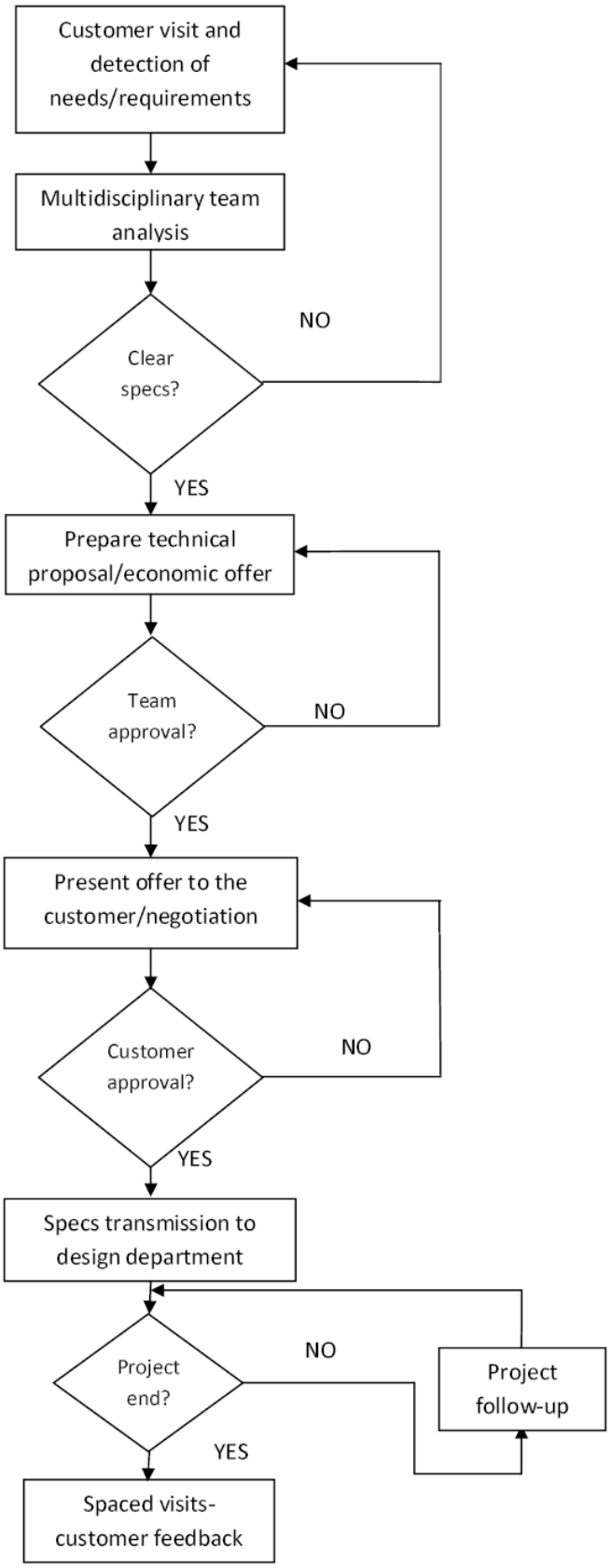

Figure 11.7: General selling procedure

starting a continuous communication with the customer in order to win these contracts. This process will be repeated periodically. The figure shown is only an approach, as reality is impossible to know for sure.

In the planning shown, we have included only three major projects, in order to have an idea of the resources necessary to use. Minor project are expected to be gained in that period. The first contract reflects what we estimate that could be the duration of a contract with Airbus Military for a basic module plus three customized modules.

11.7 Production, Procurement and After-Sales Department

11.7.1 Responsibilities

This department of AIRFID S.L. will be, in general terms, responsible for the whole process since the design of the product/service is ready for a customer to the after sales activities, covering the activities of purchases/procurement, production and after-sales services.

This department will depend directly on the general manager of the company, and thus, will report him directly.

On the firsts months of the company, in order to take advantage of the limited engineering resources available, this department will not exist, being all the efforts focused on the commercial and the Design and Engineering Department. Once the first contract is signed, and three months before the implementation of the product/service in the customers facilities, the department will be set up, and one engineer from the design and engineering department will be in charge of it.

The main responsibilities of this department will be:

- To install the product/service in the customers facilities, according to an agreed planning with them.
- To ensure that the products/services installed are in conformity with the company quality standards, as well as with the customer specifications.
- To ensure that the products/services installed are inside the planned costs for each specific job.
- To distribute the productive resources amongst the different ongoing projects.
- To manage suppliers and provide them with our approval.

- To buy the materials for every project according to customer technical and quality specifications, and searching the cheapest option amongst our approved suppliers.
- To provide after sales services to every customer. We understand after sales services as every activity destinated to solve possible problems, difficulties, needs, or doubts that a customer could have after the completion of a contract.
- To keep updated with the latest trends and technologies of the RFID and the aerospace sectors.
- To provide feedback from the customers as well as suggestions to the design and engineering department in order to improve our products/services.

11.7.2 Objectives

The production department will have as main objectives for the first two years the following:

- In the case we get a contract with Airbus Military, to finish the deployment in the period of time agreed with the customer, and get their complete satisfaction.
- In the rest of the contracts, works must be finished on time or with delays below 5% of total time of the contract.
- To execute all the contracts under the assigned cost.
- To reach a quality level of operations, such as the customer satisfaction can be measured over 85% according to our customer´s satisfaction test.

11.7.3 Structure and assigned resources

As we can see in the organization chart of the company, the production department will be directly reporting to the general manager of the company.

From the moment this department is set up, and expecting at least two simultaneous contracts during the first year, the company will hire three technicians, which will be properly allocated to both projects, all them under the supervision and coordination of the production manager (head of this department). Due to the nature of our projects, these technicians will be hired only for project periods or part-time, as it's explained in the Human Resources chapter. These technicians will carry out task related to tags preparation and printing, support to the customer in the process of installation of tags (the tags are installed by the customer), software installation,

readers/printers set up and systems validation. The production manager will supervise, coordinate and solve any possible technical problem that may happen.

Resources assigned to this department for the first year will be:

- Three technicians specialized in RFID, with good knowledge of that technology and the aerospace sector.
- One laptop, with the corresponding licenses to run specific required software and one of them (production manager) with USB modem to connect to the internet.
- Applications testing equipment shared with design department.
- Two mobile phones, one of them (production manager) with possibility to connect to the internet.

11.7.4 General procedure for products/services installation

Figure 11.8 shows the process to follow by the production department of AIRFID S.L. in the installation of products/services solutions to the customers.

First, a preliminary visit to the customer facilities is held by the project manager, typically the production department manager. The project specifications are studied deeply by the manager, making clear all technical, budget and schedule aspects. The technical specifications as well as testing procedures for that project have been prepared by the design and engineering department, while budget and schedule specifications have been agreed by a multidisciplinary team in the company before going for the tender.

Once the specifications are clear, the project manager will buy the necessary materials and equipment. While the materials are delivered, a preliminary test in the customer facilities, using AIRFID S.L. own material will be made, in order to test on site the developed software.

When the tags are received, will be delivered to the customer for him to install them in the appropriated assets/parts in coordination with AIRFID S.L. works to install the rest of materials/equipments.

With every single part and software installed and integrated, the testing procedures for each project will be made, and after the customer acceptance, a report will be sent to the general manager. At that moment, the guarantee and after sales services start for that customer/project.

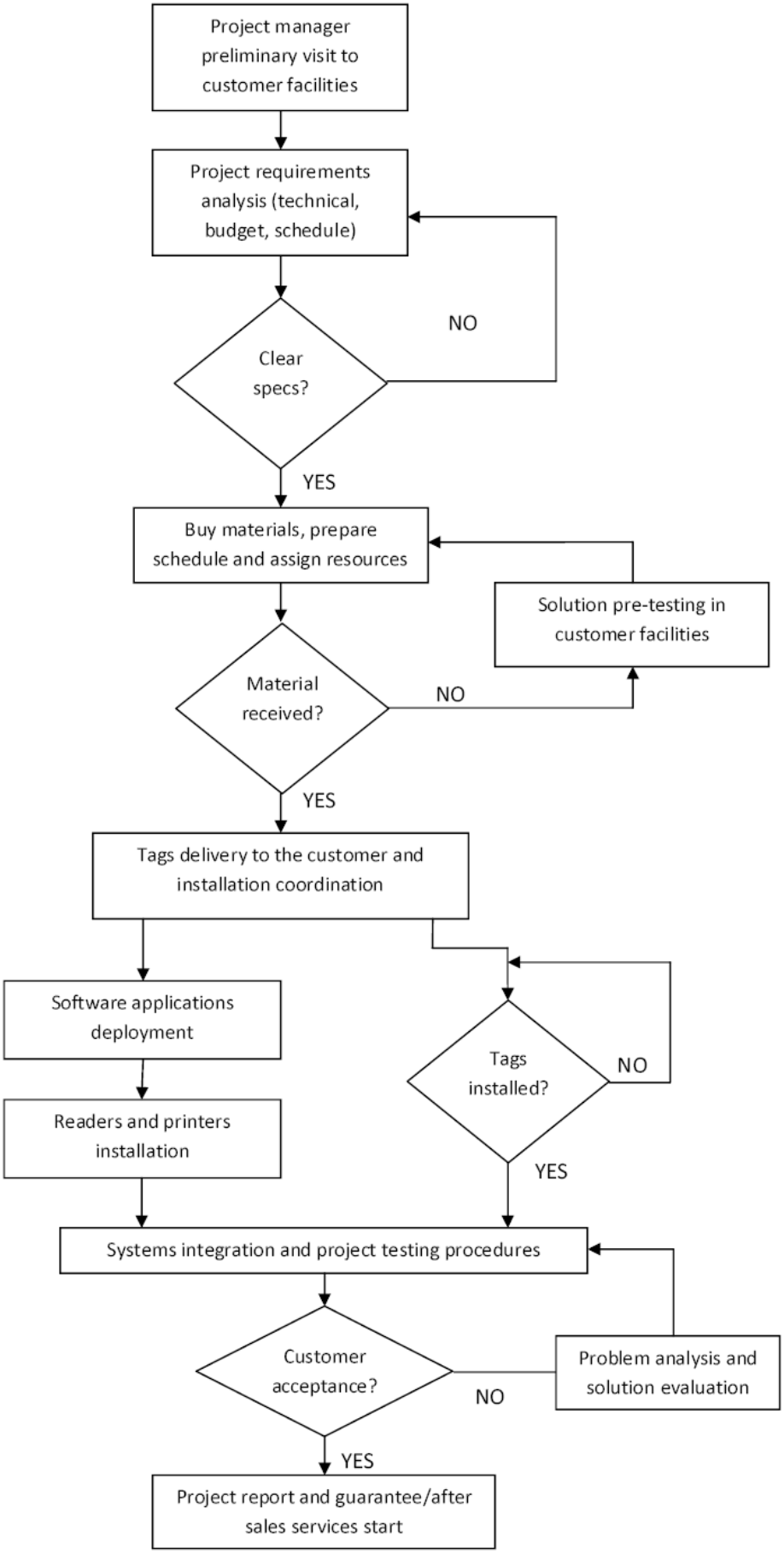

Figure 11.8: Product/Service installation procedure

11.7.5 Field technicians training

AIRFID S.L. is fully aware of the importance of human capital in the company. In the installation of solutions, the best trained people will be required. For that reason, a multidisciplinary team in the company, including the general manager, will prepare a training program for all the new technicians joining the company, focusing specially on those who will work in the customers facilities.

Training sessions will cover general and specific technical aspects related to the product and its installation, making special efforts on the troubleshooting during installation and after sales services. Also, company procedures and basic aspects of customer relationships must be treated. The training will be supervised and evaluated initially and periodically by the production manager.

11.7.6 Project milestones reference

A project should be billed using milestones, although the exact way for every single project will be agreed with the customer. Anyway, a reference for possible and desirable milestones is shown:

1. 15% at contract signing.
2. 5% at critical design review.
3. 5% at preliminary solution testing.
4. 25% at pilot project demonstration acceptance.
5. 40% rest of material delivery.
6. 10% guarantee start.

When one milestone (for each specific project) is reached by the production department, a certification is signed by the customer. The production manager will send it to the general manager in order to bill, and also will keep him and the commercial department up to date with the evolution.

11.7.7 After-sales service

AIRFID S.L. must be fully available and prepared to provide professional after sales services to our customers at any moment.

Once finished, a project will be assigned to a technician who will provide the after-sales services. To do so, his phone number will be available for

the customer as well as phone number of the production manager (is also responsible for after-sales services). Telephonic attention will be a free service for the customers independently of the time since the project was finished. A brief report of every call must be filled by the technician and delivered to the production manager.

In the case of a major problem, which requires the presence of technicians on site, technicians will report immediately to the production manager. If the guarantee period for the project is not over, no charge will be made to the customer. If yes, a proposal will be prepared by this department and sent to the customer, detailing the jobs to do in the assistance, as well as the resources and the estimated schedule, and of course, the price. After sales services will agree standard performances with the general manager, regarding time and quality responses to the customers.

11.7.8 Procurement

Procurement functions are not expected to require an important amount of resources due to the nature of our products. That´s the reason why it has been included in the same department than Production and After-Sales services, at least during the first years of operation.

However, although this function will not be very time-demanding, represents a key role in the company, as the products must accomplish with our customer´s expectations regarding quality, delivery and cost.

For that reason, we have studied a product portfolio including different kind of tags, readers and printers that could be needed in our aeronautic projects, and accomplish with the general requirements of our customers, specially those from Airbus, that, of course, could set the trends for smaller companies. For each product, we have identified possible suppliers, which present a certain reputation in the market and are classified as approved suppliers, in terms of solvency, delivery times, quality and after-sales services. This information can be found in the next paragraphs.

11.7.8.1 Main Purchase Policies of AIRFID

AIRFID S.L. plans to take advantage of the large amount of suppliers that there exist, as well as of the decrease in tag prices. This, together with the fact that AIRFID will be a high volume client, will strengthen its position when negotiating with the different providers. First of all, some equipment will be bought in order to develop the different modules and to broaden the offered portfolio. After this, when a contract is signed, a small proportion of the devices will be bought to develop the system and to do the necessary tests. Once the client agrees with the designed and developed implementation, the rest of the equipment will be bought and installed in the client's facilities.

However, it will be the client who will stick the tags as it will be responsible of controlling its inventory.

In general terms, before going for a tender, Commercial Department will send to this department, and Design and Engineering department, the requirements for materials in that project.

Design and Engineering Department will check any possible problem with the selected hardware, regarding design or develpment aspects. When these points are clear, they will give green light to Production, Procurement and After Sales Department to search for at least four different providers and will claim for offers, that will have to specify the following aspects:

1. Unitary prices for each material.
2. Total price.
3. Availability and delivery time.
4. Terms of payment.
5. Transportation costs.
6. Period of guarantee of the products offered.
7. Period of validity of the offer.

With that information, we will eliminate those providers that are not able to accomplish our expectations or to provide the required materials. The information of the rest will be sent to the Commercial Department to allow them preparing an offer including various alternatives for hardware providers/manufacturers.

Once a supplier has been selected and a contract has been signed, we start the purchase process, under supervision of the general manager.

11.7.8.2 Airbus RFID Specification

As explained in chapter 4, Airbus has already done some pilot projects using RFID technology and has decided to extend its use to other programs and production lines. For this reason, it has already issued a Tool Tagging Specification to its suppliers and providers. AIRFID has decide to follow these guidelines as they are bound to be the reference specifications for the rest of the aeronautic sector due to the high dependence from EADS they have. These are the main concepts covered by this document:

- **UHF Passive Tagging**: Overview an selection of passive tags that work in the UHF band. These are the requirements of AIRBUS on this matter:

1. The tag must be ETSI UHF EPC Class 1 Gen 2 compliant with a minimum of 96 bits memory. If possible, the tag will be Global frequency compliant (860-960 MHz).
2. The tag must be Metal Mount compliant, as most tools are metallic.
3. The largest tag possible should be used to maximize performance.
4. The tag must be low profile (4 mm or less) to minimize obstruction.
5. The tag must be ruggedized to handle abuse, especially on hand tools.
6. Tags must incorporate Higgs-3, Monza-3 or higher (Monza-4 will be available in Q1 2010) microchip technology.
7. Tags with surface area less than 4 cm by 1 cm must be readable at a distance of 1.5 meters using a fixed RFID reader that conforms to ETSI standards; operating at 2 Watts ERP (max ETSI allowable power).
8. Tags with surface area greater than 4 cm by 1 cm must be readable at a distance of 2.5 meters using a fixed ETSI RFID reader system operating at 2 Watts ERP (max ETSI allowable power.

- **UWB Active Technology**: Overview and selection of active tags for Real Time Location Solution (RTLS) technology. It has a battery that allows the tag to be read from long distance (around 100m).

- **Tag Attachment**: This part of the document explains how to attach a tag on existing tools and on new tools. Existing tools must be tagged by the company's staff and new tools could be embedded within plastic or rubber covers on the body, within a plastic nameplate or the vendor can add an antenna and aan RFID chip to the existing circuitry within a tool.

- **Tool testing protocols**: procedure for the test of the correct attachment of active and passive tags.

- **CTS Tag Data Structure**: The Corporate Tag Data Structure (CTS) describes the data that must be encoded to a 96-bit tag. This information must be encoded to every tag supplied to or used by Airbus. Table 11.5 describes this structure.

After reading this document, AIRFID S.L. has an accurate view of the requirements of the aeronautic manufacturers in terms of RFID tagging. Therefore, the company has decided to follow this specification as the best approach to enter the market.

	Bits (No.)	Information	Description
Reserved	01-08 (8)	Header	Pre-encoded on tags, tool manufacturer must not change
	09-11 (3)	Filter	
	12-14 (3)	Partition	
Required	15-28 (16)	Tag Type	1008: Tool Kit; 1009: Single Tool
	16-68 (40)	Tag ID	Must be unique across all of Airbus and Suppliers
Optional	69-95 (16)	Operation Date	

Table 11.5: CTS Tag Data Structure

11.7.8.3 Providers

AIRFID has contacted some Providers to find the products that best suit its necessities. There are two different types of providers: traditional and online. Online providers tend to be cheaper but the traditional ones are more open to negotiate and to adapt themselves to the customer's requirements. Moreover, it has been detected that within traditional providers it is a quite common trend to offer discounts of around 30% in equipment and 15% in tags with respect to price of the catalogue, while the internet providers usually have this discount included according to the units sold.

These are the main providers that AIRFID has contacted that meet the requirements of AIRBUS:

- **Nextpoint Solutions**: This company comes from Valencia and is specialized in RFID products of all the existing technologies. It works in the fields of security, leisure, hospitals, commerce, industry and logistics, and it has a large catalogue of products with portable readers, fixed readers, antennas, printers and tags that use all the different standards and many brands of the market. Furthermore, they have a personalized attention that is really useful when dealing with technical issues.

- **RFID Stuff**: This is one of the major distributor in Internet. It is operated by Frontweb and is incorporated in Florida. It supplies RFID integrators and developers with RFID equipment, supplies and support. This company sells directly online and and the only discount available depends on the number of units sold. The main advantages of this distributor are that it works with many manufacturers and the large variety of tags it has: for Metal, for Glass, for Chemicals, made of Rubber, etc. Regarding the price, it has very attractive prices in large quantities, and as it is sold in dollars it presents really competitive prices comparing to the European companies.

- **RFID Supply Chain**: This is another online distributor that also has competitive prices and is specialized in the use of RFID for Supply Chain Management. It has simmilar products than RFID Stuff and could be used as a way to save money or to put pressure on traditional providers.

- **Seidor Group**: This Spanish company is a provider of integrated solutions that also sells equipment. Therefore, it is a potential competitor as well as a provider. It mainly works on consulting, turnkey projects, microsystems, training, technical strategies and technologies in business environments.

- **Scan Source Europe**: This company from Belgium is one of the major distributors in Europe. It is contacted online and has a complete hotline service in almost every European country. Moreover, its catalogue is varied and has some of the major RFID players that Airbus

is working with, as Intermec. As a matter of fact, it is its official distributor according to Intermec's website. However, the prices are not as attractive as the ones from RFID Stuff, but it must be taken into account as an alternative supplier. It is interesting the fact that it offers financial support by offering leasing services, which can be an interesting future business line of AIRFID.

11.7.8.4 Products selected

After contacting the described providers, AIRFID is in a good position to choose among all the products offered to the company. The selected equipment is the result of applying the following criteria:

- Compliance with Airbus specification.
- Price.
- Reliability of the provider.
- Billing conditions of the provider.
- Experience of the manufacturer in RFID.
- Delivery time.

Fixed readers

Fixed readers are useful for all the logistic applications, as for the Book In /Book Out processes. In these cases, a fixed reader will be required under the table where the tools and test systems will be distributed. These are the different fixed readers selected:

- Speedway Revolution R420:
  - Manufacturer: Impinj.
  - Features: This fixed reader is able to work with 2 or 4 antennas at the same time. It has the ability to optimize automatically the reader's configuration for the best and most reliable performance, and its dutiy cylce is low, therefore the RF interference, the power consumption and the energy costs are reduced. Moreover, it can switch the antenna automatically in order to work more efficiently. It doesn't include the power supply (around 50€).
  - Providers: Nextpoint Solutions and RFIDSupplyChain.com.
  - Unit Price: 1200€(RFIDSupplyChain.com) or 1454€(Nextpoint Solutions).
- Alien Technology ALR-8800
  - Manufacturer: Alien Technology

Figure 11.9: Impinj's Speedway Revolution R420

- Features: This fixed reader has 4 ports for antennas and is specially built for the compliance of EU safety and emissions requirements. It includes power supply, power cord, serial cable and reference guides .
- Providers: RFIDstuff.com.
- Unit Price: 1350 €.

Figure 11.10: Alien Technology's ALR-8800

Portable readers

There is a high amount of portable readers in the market, many of them compatible with the different existing standards. These are the main devices selected by AIRFID:

- Intermec IP30 Hand- Held Reader
  - Manufacturer: Intermec

  - Features: This reader includes a conventional barcode scanner, it has USB and serial interface with the computer and wireless interface 802.11B/G. Its internal memory is 256 Mb, it has a keyboard and is prepared against falls of 1,5 metres of height.
  - Providers: Seidor Group
  - Unit Price: 2800€.

Figure 11.11: Intermec IP30 Hand- Held Reader

- NPH EasyTag-3
  - Manufacturer: NPH
  - Features: This portable reader is also a smartphone that can read UHF tags from 2 metres away. It runs on Windows CE 5.0 and also contains a barcode scanner an a wireless interface 802.11B.
  - Providers: Nextpoint Solutions
  - Unit Price: 1925€.

Figure 11.12: NPH EasyTag-3

Antennas

Antennas are necessary to plug to the fixed readers in order to control up to 4 different areas at the same time. By doing so, a significant amount of money can be saved and the location of assets could be much easier. Moreover, they can also be used to adapt non-RFID terminals to this new technology, which is something that may be required by a client. They need to be circularly- polarized in order to distribute the uhf energy uniformly in a radially symmetrical pattern, providing the ability to read RFID tags regardless of the orientation. These are the antennas selected:

- Circular Polarization UHF Antenna
  - Manufacturer: Alien Technology
  - Features: This antenna has 20dB of Front-Back relationship and can read devices at a distance of 5 meters. Its gain is 7 dBi and the power is 10W.
  - Providers: Nextpoint Solutions
  - Unit Price: 120€.

Figure 11.13: Circular Polarization UHF Antenna

- ALR- 9611 Circular Polarized
  - Manufacturer: Alien Technology
  - Features: This antenna has 20dBs of Front-Back relationship and has a maximum gain of 6dBi.
  - Providers: RFIDSupplyChain.com
  - Unit Price: 110€.

Printers

Printers are a basic component of a standard RFID system. However, in the case of Airbus specification for RFID, they don't have much sense given the

Figure 11.14: ALR- 9611 Circular Polarized

fact that most of the tags are metallic, and therefore must be pre-printed by the provider. However, it is possible that normal tags are used, which are less resistant but much cheaper (around 0,30€each unit). In case a printer is required, this would be the selected model:

- Zebra ZR1X
  - Manufacturer: Zebra
  - Features: This printer has a fully integrated module as a UHF RFID Reader/Encoder and has a calibration feature with automatic program position selection for optimal trasponder placement. the technology it uses is the thermal transfer or the direct thermal and it is built on a 133MHz RISC processor
  - Providers: RFIDSupplyChain.com, RFID Stuff, Nextpoint solutions
  - Unit Price: 1800€.

Figure 11.15: Zebra ZR1X Printer

Tags

Tags are one of the most important entities in a RFID system. Fortunately, Airbus has given a lot of details on the features they must have, and the

market is already prepared to fulfil these needs. These are the tags selected by AIRFID:

- UHF Blue Tag Slim on- Metal
  - Manufacturer: Sontec
  - Features: This is a metallic, rigid UHF tag that is capable of working under difficult thermal and chemical conditions. It can be rewritten 100000 times. This version is slim, which makes it suitable for metal cases. Its dimensions are 111x32x8mm and its range is from 2 to 5 metres, depending on the presence of metals and liquids.
  - Providers: Nextpoint solutions
  - Unit Price: 2,10€.

Figure 11.16: UHF Blue Tag Slim on- Metal

- On-Metal Tag SW
  - Manufacturer: Omni-ID
  - Features: This tag is readable from 6 metres and its dimensions are 42x32x6mm. There is a smaller version of this same tag with the dimensions of 13x38x3mm. In this case, its range is only 2,5metres
  - Providers: Nextpoint solutions
  - Unit Price: 1,50€the small tag and 3,20€the biggest tag.

Figure 11.17: on-Metal Tag SW Tag

- Frontweb SARC-001

- Manufacturer: Frontweb
- Features: This tag is able to be used on metal an all other surfaces. It works on Alien Higgs 3 technology and it can be read from 7 metres away. Its dimensions are 99x12x12mm.
- Providers: RFID Stuff
- Unit Price: 1,05€.

Figure 11.18: Frontweb SARC-001 Tag

Chapter 12

Legal Plan

12.1 Business description

As we have explained in this document, the purpose of this company is to offer to the companies RFID solutions in the aeronautic sector. AIRFID is a RFID consultant company which provides software, hardware and know-how to the customers. The company will be created by 5 main shareholders:

- José María Álvarez Hirado.
- Humberto Astudillo Mendinueta.
- Jesús Garrido Molinero.
- Daniel Portela Romero.
- Carlos Sánchez Cazorla.

Although the main office will be established in Seville, in the expansion plan we consider to open a new office in Madrid.

12.2 Legal structure

First of all we need to study which kind of company we are going to create [38]. We think that the best formula is a company where the liability of the shareholders is generally limited to the amount of capital contributed like in a corporation but the capital stock. Therefore, we need to study the applicable legislation in Spain.

12.2.1 Applicable legislation

Spanish corporate law was substantially modified by Law 19/1989. One of the stated purposes of this law was to adapt Spanish corporate law to the

relevant EU Directives following Spains accession to the European Community. However, Law 19/1989 is more than a mere adaptation, since it includes many new provisions which are not required by EU law.

Due to the very substantial modifications introduced by Law 19/1989, an amended version of the Corporations Law including such modifications was approved by Legislative Royal Decree 1564/1989 on December 22, 1989. This legislation is referred to hence- forth as the Corporations Law.

Following the promulgation of Law 19/1989, which dealt essentially with corporations, a new law regulating limited liability companies was enacted in 1995 (Law 2/1995), and Royal Decree 784/1996 was also enacted, establishing new Mercantile Register Regulations.

The Commercial Code, the Corporations Law, the Limited Liability Companies Law and the Mercantile Register Regulations are the basic sources of law in this field.

Lastly, the EUs Council of Ministers on October 8, 2001, adopted Council Regulation (EC) 2157/2001, which passes the Statute for a European Company (SE), together with Council Directive 2001/86CE, which completes the Statute for the European Company with regard to the involvement of employees.

This Regulation came into force on October 8, 2004. Act 19/2005, of November 14, on the European Company domiciled in Spain, guarantees the effectiveness of the directly applicable rules contained in the Regulation, and is complemented by the internal measures required for such purposes. Regarding the Directive, its implementation into national law was completed and came into force on October 20, 2006, through Act 31/2006, of October 18, regulating the intervention of employees in the Corporations and cooperative companies.

The Regulation of the European Company affords to companies operating in various Member States the option of being established as a single company under certain aspects of EU Law and being capable to operate throughout the EU with a mixed regulation in which national and EU rules coexist, and unified management and incorporation and operation system. For companies acting in different EU Member States, the European Company offers the possibility of reducing their administrative costs with a legal structure adapted to the EU Regulation. This new Regulation may result in the restructuring of large companies currently operating in various Member States.

12.2.2 Forms of business enterprise

Spanish law envisages various different kinds of mercantile entities, all of which can be used by foreign investors. The most significant are:

- Corporation (Sociedad Anónima, abbreviated as S.A.).
- European Public Limited-Liability Company (Sociedad Annima Europea, abbreviated S.E.).
- Limited Liability Company (Sociedad de Responsabilidad Limitada, abbreviated as S.L. or S.R.L.).
- New Limited Liability Company (Sociedad Limitada Nueva Empresa abbreviated as S.L.N.E.).
- General Partnership (Sociedad Regular Colectiva,abbreviated as S.R.C. or S.C.).
- Limited Partnership (Sociedad en Comandita, abbreviated as S. en Com. Or S. Com.) or Limited Partnership by Shares (Sociedad en Comandita por Acciones, abbreviated as S. Com. p. A.).

Traditionally, the corporation (S.A.) has been by far the most commonly used form, whereas the limited partnership has been rarely used.

However, the limited liability company (S.L.) has gained popularity as a result, among other reasons, of its comprehensive regulation under Law 2/1995 and a lower minimum capital requirement than that for S.A.s.

The new limited liability company (S.L.N.E.) is a recently created type of limited liability Company which simplifies its incorporation requirements.

Some of the salient features of each of the above corporate forms are summarized below. It should be noted that in many instances the Law provides only minimum standards or general rules. The founders of a company have a great deal of flexibility in tailoring the structure of the company to their specific needs through inclusion of certain clauses in the bylaws, for which purpose they should seek proper legal advice.

Therefore we have many different options to create our company. Nevertheless the most common formulas are: Corporations or Limited Liability Company. Hence we will focus on these ones.

12.3 Liability of shareholders and partners

Both the S.A. and the S.L. are companies with capital in which the liability of the shareholders is generally limited to the amount of capital contributed by each.

Technically, the capital of an S.A. is divided into shares, whereas the capital of an S.L. is divided into participation units. The general rule is clearly one of limited liability; however, under very exceptional circumstances, the corporate veil can be pierced to protect the interest of third parties. In these

exceptional cases, the courts have followed the criteria of the piercing of the corporate veil as a reaction against the abusive taking advantage of the companys legal status by the shareholders or partners for fraudulent purposes; the courts may obviate it and differentiate the equity of each of the partners to establish liabilities.

Liability is not limited in a general partners (S.R.C.). General partners are personally jointly and severally liable with the whole of their net worth for the debts of the partnership.

A limited partnership (S. Com.) is a partnership in which there is at least one general partner and one or more limited partners. General partners are personally jointly and severally liable with the whole of their net worth for the debts of the partnership. Limited partners are only liable for the amount of capital they contribute or promise to contribute to the partnership. The capital of limited partnerships may be divided into participation units or shares.

The main differences between S.A. and S.L. are shown in Table 12.1.

Element	Corporation	Limited liability company
Minimum capital stock	60,102€	3,006€
Paying in upon incorporation	At least 25%, and the share premium, as the case may be	Fully paid in.
Shares units	They are securities. Debentures and other securities can be issued.	They are not securities. Debentures and other securities can not be issued.
Transfer of share units	Depends on their representation (share certificates, book entries, etc.) and on their nature (nominative or bearer shares).	Shall be effectuated by a public document.
Amendments to the bylaws	The directors or, as the case may be, the shareholders making the proposal shall prepare a written report to justify the amendment.	No report is required.
Contribution in kind	A report from and independent expert is required	No report is required.

Table 12.1: Main differences between S.A. and S.L.

Element	Corporation	Limited liability company
Call for general meetings	Announcement published in the Official Gazette of the Mercantile Register and in one of the daily newspapers with widest circulation in the province where it has its corporate address.	As indicated in the by-laws (call for by written communication is valid). If not, annoncement published in the Official Gazette of the Mercantile Register and in one of the daily newspapers with widest in the municipally where it has its corporate address.
Place of general meetings	In the locality where the company has its corporate address.	Where indicated in the by-laws. If not, in the municipality where the company has its corporate address.
Attendance to and majorities in General meeetings	Different attendance requirements and majorities are established for first and second call and depending on the content of the decisions. These can be increased by the by-laws.	Different majorities are established depending on the content of the decisions. These can be increased by the by-laws.
Attendance and voting rights in the General meetings	There might be restrictions (minimum number of shares, etc.).	These rights can not be restricted.
Managing body	The by-laws must indicate a specific managing body (Board of Directors, Sale Director, etc).	The by-laws may set forth different types of managing bodies among those legally provided for and the General meeting will select one of them.
Number of members of the Board of Directors	Minimum: 3. There is no maximum number.	Minimum: 3. A maximum of 12 members.
Term of the office of Director	Maximum 6 years. They may be reelected for periods of the same maximum duration.	Might be indefinite.

Table 12.1: Main differences between S.A. and S.L.

12.4 Basic characteristics of limited liability companies

Our company is going to be founded as a Limited Liability company. Law 2/1995 on Sociedades de Responsabilidad Limitada (Limited Liability Companies) which came into force on June 1, 1995, made certain important changes to the legal framework governing the limited liability company (S.L.) which can sometimes be used as an alternative form of business entity instead of the S.A.

Flexibility is one of the main objectives of Law 2/1995, which allows the participation unit holders (members) a wide margin in setting up, in the bylaws, the rules concerning the internal governance of an S.L. An S.L. is intended to be a more closely held entity as evidenced by the fact that:

- Participation units are generally not freely transferable unless acquired by other participation unit holders, ascendants, descendants or companies within the same group. In fact, unless otherwise provided in the bylaws, the Law establishes a pre-emptive acquisition right in favour of the other partners or the company itself in the event of transfer of the participation units to different persons than those aforementioned.
- Debenture issues cannot be used as a means of raising funds because an S.L. is unable to issue debentures since Law 2/1995 came into force.
- The scope for representation at the General Meeting is limited.

Some salient features of the above-mentioned Law are described below.

- An S.L. cannot have a capital stock of less than 3,006€, which must be fully paid up at its organization. Capital Stock must be divided into participation units, but these need not all be the same (and, consequently, they may carry different voting weight).
- Non-voting participation units may be created, up to the limit of half the capital of the company.
- The genuineness of monetary contributions made at the time of incorporation or in connection with any capital increases must be attested to before a notary public.
- No independent appraisers report on non-monetary contributions is required, although the founders and shareholders are jointly and severally liable for the genuineness of the non-monetary contributions made. Similarly, in capital increases the directors of the company are liable for the difference between the value of the nonmonetary contributions stated in their report and the real value of the contributions.

12.5 Steps to create the company

We are interested in creating a S.L.company located in Seville with a CNAE (Clasificación Nacional de Actividades Económicas) number code of 7112 which includes "Servicios técnicos de ingeniería y otras actividades relacionadas con el asesoramiento técnico". The capital stock must be fully subscribed and it has to be fully paid at the moment we register the company.

In order to get some help we can go to different associations in Seville. One of them is called *Ventanilla Única Empresarial (VUE)* [39]. It provides a lot of useful information about creating a company, as well as helping you with all the necessary steps.

Another association we have contacted is *Confederación de Empresarios de Andalucía (CEA)* [40]. They have a department focused on helping young people who want to create their own business. We got a lot of information regarding the Business Plan.

After meeting several times with a VUE agent, the steps we need to take are the followings:

1. The first step is to ask for a certificate of clearance for use of the name of our new company at the Spanish Central Mercantile Register. This step should precede all others, to ensure that the proposed name can in fact be used. It costs about 15€ to ask for this certificate. After paying this tax in Banesto (Account Number: 0030-1142-07-0870002271), you get a form where you can ask for 3 different names. If the first one is busy they will check for the second one, and so on. If none of the 3 names are available, you will need to pay again taxes in order to apply again. Our proposals are, ordered by priority, AIRFID S.L., AIRFID Solutions S.L., and Aerofid S.L.

2. We need to open a bank account for the activities of our company. After visiting some banks and choosing between the different offers, we have selected Banco Santander.

3. Execution of the public deed of incorporation in the presence of a Spanish public notary.

4. Evidence of the identity of the founder shareholders. The public notary will require the persons who appear before him for this purpose to exhibit: evidence of their identity; the power of attorney (if applicable) to represent a third party on whose behalf any of them appears; evidence of payment and whether it is to be made in cash or in kind (if applicable); the name clearance certificate from the Mercantile Register; and the form (to be signed by the notary, if applicable) for subsequent declaration of the foreign investment to the DGCIs (General Directorate for Trade and Investment) Foreign Investment Register. It is also necessary to provide the notary with the bylaws of the company.

In our company the capital stock is 100.000€ divided in 1000 shares of 100€ each. All the shareholders have made the payment in cash as follows:

A board formed by the 5 shareholders will represent the administration of the company, as the notary subscribes, all this capital is paid at the moment of the execution of the public deed.

5. The founders of a company have a great deal of flexibility in tailoring the structure of the company to their specific needs through inclusion of certain clauses in the bylaws. An S.L. is basically governed by the Corporations Law and by its bylaws.

6. Assignment of a tax identification number to the new company (NIF or CIF). This is a necessary step for the payment of transfer tax (see below) and the registration of the company in the Mercantile Register. This step (which involves no cost) consists of filing a special form (also used for VAT purposes) together with certain documents with the competent tax authorities. A provisional number is granted automatically. Once the company has been registered in the Mercantile Register, it must obtain the definitive tax identification number within a maximum period of six months from the issuance of the provisional number. We ask for it in the *Agencia Tributaria (AEAT)* by the 036 model.

7. We need to pay two different taxes: *Impuesto de Transmisiones Patrimoniales (ITP)* and *Actos Jurídicos Documentados (AJD)*. We need to pay 1% of the Capital Stock in terms of *Operaciones Societarias*. We will see these costs later

8. Register the company in the Mercantile Register. After this, we will get the definitive tax identification number (is the same provisional number we got before). At this very moment, the company acquires legal status and capacity.

9. Subsequent declaration of the investment to the General Directorate for Trade and Investment (DGCI) of the Ministry of Economy and Finance. Prior declaration is in certain cases required, especially for foreign investments originating in territories or countries deemed to be tax havens.

10. Registration of the company for the purpose for IAE (Business activity tax). Newly incorporated companies must use the same special form used to request a tax identification number, to describe their business activity, and specify the article of the Law by virtue of which they are exempt from this tax (newly incorporated companies or companies starting a new business activity are exempt from this tax for the first two tax periods). This step must be completed before the company starts operation. For the moment, we dont have to pay this tax because newly incorporated companies or companies starting a new business activity are exempt from this tax for the first two tax periods. We

have to take into account that this registration must be completed before the company starts its activity.

11. Registration of the company for VAT purposes, as the previous point, this registration must be completed before the company starts its activity.

12. Opening license.

13. Registration of the company for Spanish Social Security and occupational accident insurance purposes, and registration of the employees for Social Security purposes. If we had foreign employees, in addition of the documentation for Spanish employees, we would have to present the documentation of their nationality and a work authorization.

The main steps for incorporation of a company through cash contributions is shown in the figure 12.1 .

12.6 Bylaws

Article 1. Denomination and Identity

AIRFID S.L. is a limited liability company registered in the Spanish Mercantile Registered with a tax identification number CIF: C-47832624.

Article 2. Legal Address

AIRFID S.L. is settled in Avda. José Galán Merino s/n. 41015 Sevilla. This legal address may be changed in shareholders meetings if the voting requirements are satisfied. The shareholders meetings can also decide to open other company subsidiaries in the Spanish territory or abroad.

Article 3. Sector

AIRFID S.L. is involved in providing RFID solutions in the aeronautic sector.

Article 4. Duration

The duration established for the company is undefined. The bylaws may be reviewed once a year.

Article 5. Principles

AIRFID S.L. is an independent company not linked to any political party, supplier or other organisation, which might imply a modification in the company objectives.

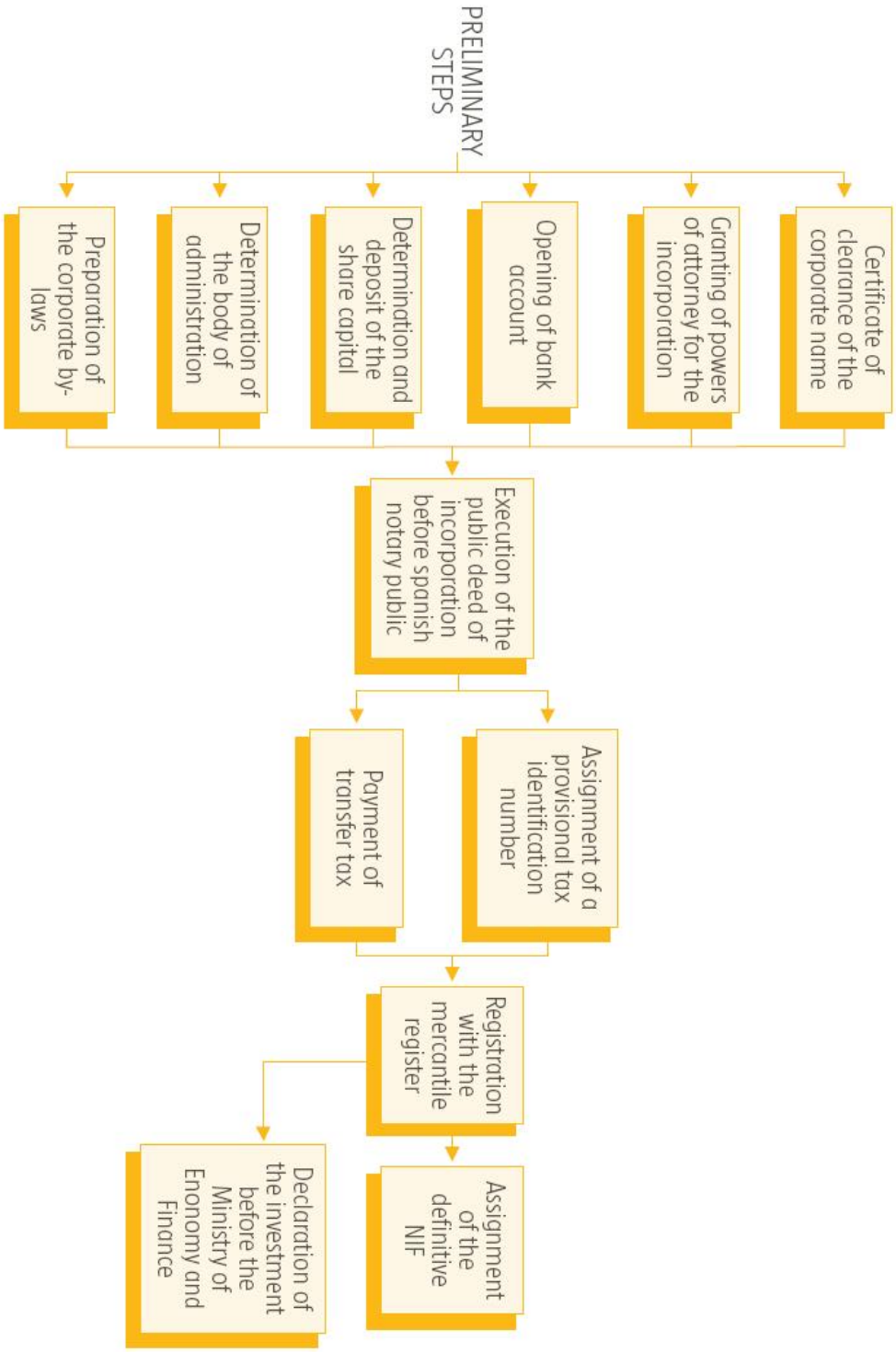

Figure 12.1: Proceedings to constitute a society

AIRFID S.L. is a democratic association which applies democratic procedures to achieve decisions. This guarantees the fair political conditions.

AIRFID S.L. is pluralist in relation to political, religious, ideological conditions.

Article 6. Objectives

1. To provide RFID products to any individual or company which could be interested.

2. Management and sales of RFID products.

Article 7. Recruitment and outsourcing

The director is in charge of the recruitment and outsourcing needed.

Article 8. Shareholders meetings

The Ordinary and Extraordinary General Meetings will be placed where the company has its corporate address. All the shareholders have to attend to the Ordinary and Extraordinary General Meetings. In case they cannot, can be represented through other shareholder, husband/wife or descendants. This representation has to be confirmed by written.

- **Ordinary Meetings**: These meetings will take place once a year; the exact date will be arranged by the director. The General Manager will communicate three months in advance the date of the meeting. The topics will be decided by all the members involved in the meeting. If a voting is needed to decide any action to take it will be secret. This meeting will decide the actuation guidelines for the incoming year. The decision will be approved when at least the 51% of the total share of the company agrees.

- **Extraordinary Meetings**: These meetings will take place when at least the 51% of the total share of the company agrees. The topics will be decided by the same way as in ordinary meetings.

Article 9. Administration body

Carlos Sánchez Cazorla is the General Manager of the company. The General Manager of the company is in charge of every legal or administrative issue of the normal operation of the company and has to be re-elected each 5 years.

Article 10. Economic Management and Profits.

In the Shareholders' Meetings it will be decided the amount what to do with the company profits. In the same way it will be decided the amount of money reinvested in the company.

Article 11. Corporate signs

Every shareholder, as well as the director, has the power of using the social sign of the company.

Article 12. Transfer of shares

The transfer of share by any shareholder will be take place during a Shareholder's Meeting. For the transfer of shares at least the 51% of the total share of the company have to agree.

Article 13. Loss of partnership condition.

The loss of the partner condition will occur in the following scenarios:

a) By his/her own free will.

b) Non-fulfilment of the good intentions towards the company.

In any case, the Director will convene an extraordinary shareholders meeting to be celebrated in the following two months. The participation of the missing partner will be frozen until the Shareholders decide in the meeting the guidelines to follow on this matter. In this case the approval frontier will be 55% of the total shares of the company.

If any of the shareholders wants to stop the activity with this company, the rest of shareholders will have preferential right to buy these partitions.

Article 14. Accounting year-end

The accounting year-end will be on December 31st.

Article 15. Date of operation starting.

The date at which AIRFID S.L starts operating is July 1st 2010.

12.7 Fiscal planning

12.7.1 Dividends

There will not be any dividends during first 4 years. This money will remain in the company. From then on, as we will see in the financial plan, depending

on the different scenarios the company will give a different amount of its profits to the shareholders. The remaining amount of money will be used as reserves for the company.

12.7.2 Corporate Taxation

The company will be established in Spain so it would pay the Spanish corporate income tax. If the net profit is below 120.202,41€ the corporation taxation will be 25%. As we have seen in the economic planning during the first 3 years we will face this rate. Followings years we will face 30%.

However, as the company is going to have losses during first years, we could use a tax shield in order to reduce the amount of taxes payable. The tax shield means that the company would discount the taxes that it should pay if the losses would be profits instead, from the taxes that it should pay the first year that the company has profits. All this process is explained in the financial plan.

12.7.3 VAT

The standard VAT rate in Spain is 16% (it will be changed to 18% along this year). As we are a company, we need to recollect VAT for the customers and to present a VAT Balance every 3 months and at the end of the year to *Agencia Tributaria*. This report will show the balance between the Input and Output VAT.

12.7.4 Social contribution

Due to we will employ some workers, the company should be aware of the Social Contribution Tax. The amount of this tax depends on the employee professional category. Right now the maximum monthly base is about 2,897.70€ and the minimum depends on the kind of job.

General risk, unemployment insurance and professional education training is a total rate of 6.4% for the employee and 30.6% for the employer. This 30.6% is the total amount we need to pay for each employee.

12.8 Subsidies

As we are young entrepeneurship and we are going to settle our company in Andalusia we can apply for many different subsidies. *Consejería de Innovación, Ciencia y Empresa* provides a general framework with regulatory measures, fiscal advantages and incentives oriented to boost the technology

effort in the Andalusian companies, encourage the research and development, as well as the technology transfer and innovation projects.

12.8.1 Regional Financial help

Regional incentives are financial aids, co-financed by the European regional development fund, awarded by the State to encourage productive investment business, focusing its localization to predetermined areas.

The autonomous community of Andalusia, collaborates with the Ministry of Finance, through the Department of Innovation, Science and Enterprise in the management and processing of the applications.

In Andalusia, the precise definition of areas of application and maximum incentive, as well as specific requirements on economic sectors, eligible investments and conditions are set out in Royal Decree 162/2008 of 8 February, by which defines the area of economic promotion of Andalusia.

Projects able to be promoted are those related with creation of new establishments, expansion of an already established business or launching a new company by the applicant and the upgrading of facilities, but taken into consideration that they will not be merely a replacement investment.

Projects must meet, among others, and mainly, the following conditions:

1. Investment started not before submitting the application.
2. At least 30% self-financing and economic viability, technical and financial.

The aid consists of outright grants as a percentage of the costs considered eligible, is regulated by "BOE Número 59 de 09 Marzo de 2008", and it has relevance till 31th December, 2013.

12.8.2 Programa para el Fomento de la Innovación y el Desarrollo Empresarial en Andalucía

Programa para el Fomento de la Innovación y el Desarrollo Empresarial en Andalucía. Convocatoria 2008-2013. It is runned by *Junta de Andalucía* and you all the legislation can be read in *Orden 9 de diciembre de 2008 de la Consejeria de Innovacion, Ciencia y Empresa (Boja num. 249 de 17 de diciembre de 2008).* Depending on the purpose of the project, the incentives will go to:

- Business creation.

- Modernization of companies.
- Cooperation enterprise competitiveness.
- Research, development and innovation. This includes incentives for innovation advisory services.

The incentives referred to in this Order are financed by the European Union through "Programa Operativo FEDER Andalucía 2007-2013."

This is an interesting program and we are thinking to hire a person in order to work on this or may be to pay to an external company. There exist some companies that are professionals of applying for these subsidies (they will charge us a percentage).

12.8.3 PANIE

The city council offers every year (it has not been released the fund for this year yet) an interesting program call Ayudas PANIE" (Plan de Ayudas para Nuevas Iniciativas). The purpose of this program, conducted by the "Servicio de Promoción y Formación Empresarial de la Delegación de Economía y Empleo" is to promote and support business initiatives launched in the city of Seville.

These aids can be applied by all those natural or legal person that fulfills the requirementes therein. It is important to point out that initiatives should be located and implemented in the municipality of Seville.

Eligible expenses are those that have been made and paid, from 1st January 2007 and 30th April 2009 (it has not been released the fund for this year yet), and corresponding to: start-up costs, rental of premises, management entity costs, insurance premiums, health technique for curriculum development in occupational risk prevention, other technical assistance directly related to business, advertising and salaries and social security.

The amount of aid is determined by the total amount of the expenditure, with a maximum of 4,000 euros and a minimum of 2,500 euros each.

For further information and deal with this aid, we must contact with *Oficinas de los Técnicos de Asesoramiento Empresarial (ALPEs)* located in various places around town.

12.8.4 Offices

12.8.4.1 CADE

Centros de Apoyo al Desarrollo Empresarial (CADE) is a foundation that belongs to *Junta de Andalucía* whose mission is to promote the development

of entrepreneurial culture and economic activity in Andalusia, with the aim of contributing to the generation of competitive enterprises and quality jobs in this region.

CADE provides a wide range of services to help citizens to create or strengthen entrepreneurial enterprises and employment. These include:

1. Qualified information and advice.
2. Basic and advanced management training.
3. Tutoring.
4. Help in finding ways of funding.
5. Corporate accommodation. This is the service we are looking for.

They have two offices for corporate accommodation in Seville and if you present them your idea and they approve it, you will have the opportunity of using these buildings for free for 6 months. However, he have contacted with them and, at this moment, all these office are busy.

12.8.4.2 CREA Sevilla

The second option is to settle our office in *CREA Sevilla (Centro de Recursos Empresariales Avanzados)*. This is a Centre for the Incubation of Companies promoted by the city council that offers to young entrepreneurs, an space where they can start their business.

These facilities support entrepreneurs with 3,000 m^2 above ground, have a supply of 20 modules and are fully furnished and equipped, from 30 to 60 m^2; advanced Internet services, maintenance, daily cleaning and 24 hour security, meeting rooms; 46 parking spaces, two classrooms for training programs, reprographic services, document resource center and an auditorium for 178 people fully equipped with two cabins that allow simultaneous translation up to four languages.

CREA Sevilla demands fulfilling the following requiremente in order to apply for an office:

- The business project must be related with Information and Communications Technologies
- The company should have been formed within 3 years
- This company must be an Small and Medium Enterprise according to "Comision Europea de 1 Enero de 2005"
- The company must be placed in Seville

- The project must be feasible

In figures 12.2, 12.3 and 12.4 you can see a typical office provided by CREA Sevilla.

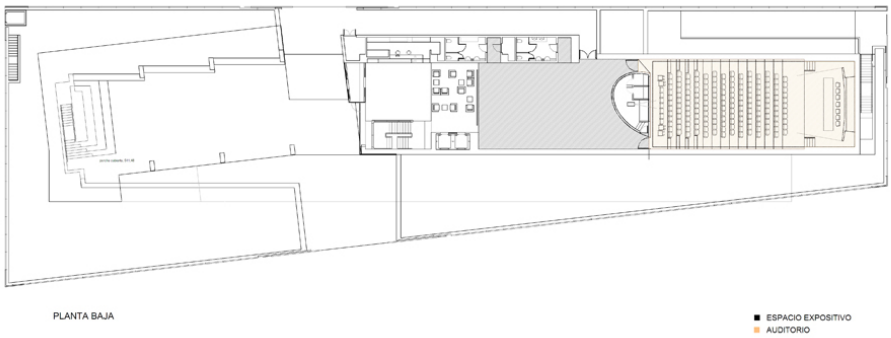

Figure 12.2: Crea Sevilla's plan

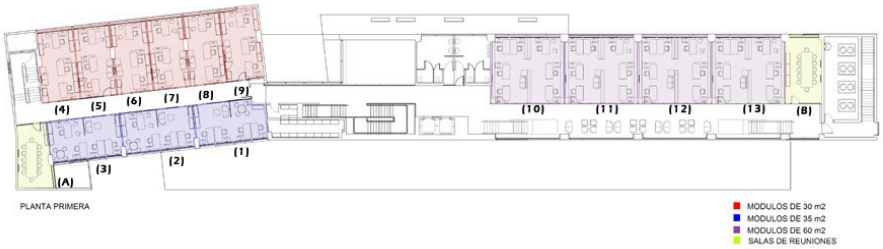

Figure 12.3: Crea Sevilla's distribution of the offices

Information about CREA Sevilla

On 31st January 2006, CREA, the Centre for Advanced Business Resources, was inaugurated. The new facility, with financing from the European Union and Seville's City Council, has as its mission to develop the first business incubation programme in Seville and at the same time act as an integration facility to work with associations and local entities to give orientation, information and training tasks to the enterprises.

This new public facility for the entrepreneur, with a 3,000 m^2 usable area above grade, offers 21 modules which are completely furnished and equipped, ranging from 30 to 60 m^2, advanced Internet services, 24-hour maintenance and security, four meeting rooms each with a capacity for 12 people, 46 parking spaces, two classrooms for training programmes (one with a capacity for 35 people and the other with computer equipment for a total of 18 people), reprographics services, a centre for documental resources and a fully-equipped auditorium with a capacity for an audience of 178 persons, including two interpretation booths for simultaneous translation equipped to work in four different languages at the same time.

Figure 12.4: Crea Sevilla's office

In accordance with the strategic and operative management models established, CREA offers pre-incubation services, such as consulting for business proposals including the necessary help for elaboration of a business plans, incubation, which, together with the temporary housing of new and recently created businesses, offers consulting, training and mediation; and post-incubation services.

During these first eleven months of the activity's launching, the incubation service has served 48 housing requests in the Centre, and the pre-incubation service has offered information and consulting to more than one hundred businesses ideas, with an average of 15 users a day utilising this services' resources: business posts composed of a computer and telephone; a space for meetings and documental resources. At 31/12 the module area for the temporary housing of new business projects has a 72% occupancy rate, housing 12 businesses with a total of 58 employees.

With respect to the Department of Entrepreneurs and the New Economy at the University of Seville, in its fourth year running it has joined SEVILLA GLOBAL as a sponsor for the aeronautical group EADS-CASA, the science and technology park Cartuja 93 and the financial entity Caja Madrid. During 2006 the Department has strengthened its presence throughout the various campuses within the Seville University, with the goal of providing students with the basic knowledge which allows them to take on the start-up of their business projects. This programme had a participation of 225 pupils.

SEVILLA GLOBAL took part in the Day of the Entrepreneur on 3 and 4 May, an event organised by the Ministry of Innovation, Science and Enterprise, held in the Exhibitions and Conventions Centre, where CREA, the Centre for Advanced Business Resources offered its services. This same ob-

jective entrusted the presence of SEVILLA GLOBAL at the Provincial Exhibition (Muestra de la Provincia) that is organised annually by Seville's Provincial Council. This edition had entrepreneurs as its central theme.

On the other hand, in July of 2006 the Seville Entrepreneur Forum took place (Foro Sevilla Emprende). It is an initiative from SEVILLA GLOBAL, the Ministry of Innovation, Science and Enterprise and the Autonomous Government of Andalusia, Caja San Fernando and the Antares Club, whose goal is to stimulate a public debate about Seville as an urban, industrial and innovative economy.

Chapter 13

Human Resources Plan

This chapter describes the different aspects of the relation of AIRFID S.L. with its main asset: its workers. As this new company needs to be built on top a highly motivated and capable group of people, managing Human Resources properly is essential for the success of the whole business.

AIRFID S.L. aims to be a modern company with modern values that will enable it to be competitive in the market due to a clear target oriented strategy, a warm work atmosphere and a big amount of cooperation among workers. It is really important that all the staff of this company is aware of the magnitude of the challenge they are facing. They need to do their best to achieve the objectives set by the company, and the only way to do so is making everybody know exactly what they are doing, feeling important in the organisation, being valued when they perform their job correctly and being formed when they detect the lack of any kind of knowledge related to their professional activity.

To start with, the Company's values are going to be explaned in the next section. After this, the Organizational Chart will be described by functions and by work positions. Besides, the staff planning for the first 5 years is explained to have a clear view of the new work positions that are going to be created according to the Operational Plan in Chapter 11. Finally, the remuneration and other Human Resources policies are stated in sections 5 and 6.

13.1 Company's Values

This section is part of the Human Resources chapter as no "official" values are important in an enterprise if they are not shared among its employees. A stable and successful company must be based on a brief set of values that strengthen its internal aptitudes in order to show an image of a reliable and modern company that adapts well to the changing environments and that always reacts efficiently whenever the problems arise. Hence, it is important

that all the workers share the following values, which will be included in the different measures described in this chapter.

13.1.1 Client oriented approach

AIRFID is not developing applications that considers that are technically the best, it produces applications that suit the client in the best possible way. Every single employee must bear in mind that customer satisfaction is essential for the success of their company, so "putting themselves on the clients' shoes" is an activity that they must practice everyday as much as possible. Whoever contacts the client must be fully respectful and aware that their future depends on the way they satisfy clients' needs. Moreover, the companies from the Andalusian aeronautic sector have close relations between each other, which makes customer satisfaction the best possible marketing campaing.

13.1.2 Continuous improvement

It is essential that the official state of the company is "in continuous change". RFID technology is bound to continue changing along the years, as well as the different clients' profiles and needs. Only by adapting to times and by being aware of the new emerging technologies (substitutes) and competitors (entrants), AIRFID can offer an attractive set of products that would evolve according to times. All the departments must spend time doing some research about this topic: reading specialized magazines, attending to courses and lectures about any important topic related to their activities, and visiting the clients to be always aligned with the market needs.

13.1.3 Target oriented approach

Any company depends nearly exclusively on achieving the desired results. Therefore, every employee must know exactly which the main targets are. For this purpose, meetings will be arranged periodically to keep the staff updated with the new contracts and different internal and external aspects that are important for the overall performance of the company. Every worker will be assessed on a results basis, and even the salary will vary according to each worker's performance as well as according to the company's results. This mixture is important for the sake of fellowship, as workers will help each other to achieve the best possible results from the company as a single entity. Moreover, they will do their best in their personal tasks to benefit from the set bonuses which will be significant together with reasonable for the company's interests.

13.1.4 Knowledge Management

An important problem that big companies face is making sure that what people learn is applied all over the company. It normally happens that a department spends a lot of resources dealing with a problem that other departments have already solved. Dealing with this is a really difficult task for big companies, but a small company like AIRFID must take advantage of this by sharing the acquired knowledge with the different departments in order to be more competitive and cost-efficient. Therefore, the members from the different departments will be in contact with each other, and regular meetings will be held by the people in charge of the different departments. Moreover, an intranet server will be accessible with the different documentation found by all the departments, and a wiki page will contain the major breakthroughs made and clear instructions that will make much easier the adaptation of new employees.

13.2 Organizational Chart

The Organizational Chart is a result of the Operational Plan of Chapter 11, where the roles of the different departments are explained in detail. Therefore, this section will be an overview of the organization designed in the Operational Plan. The next figure shows the different organizational charts for the first three years of AIRFID S.L. Note that the work positions do not appear, as they are explained in the next section.

The first months since the establishment of AIRFID as a Limited Liability Company will be spent developing the different modules that will form the initial portfolio of the enterprise. Therefore, apart from the General Manager and the Management board, the main departments will be the Commercial and the Design & Engineering departments. This can be seen in the following figure:

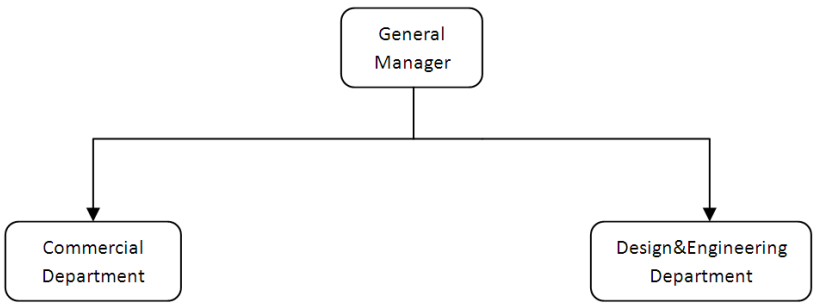

Figure 13.1: Initial configuration of the departments

A crucial point in AIRFID's evolution is the award of the first contract. From this moment on it will be necessary to have a Production department

that will take care of the implementation of the designed modules in the client's factories. Hence, this will be the Organization Chart after the first contract:

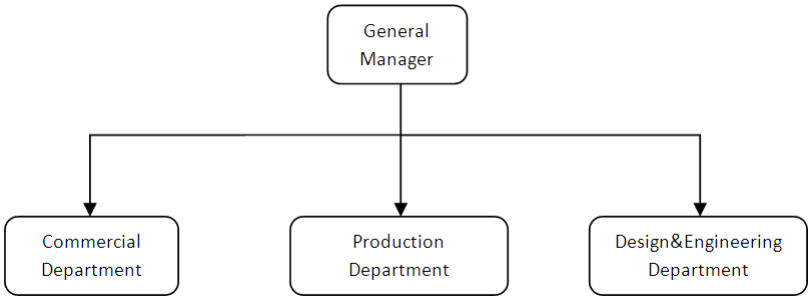

Figure 13.2: Configuration of the departments after the first contract

13.3 Description of Work Positions

As the departments have already been described in the Operations Plan, it is already clear what is done by each department. However, it is still necessary to give concise information about what is expected from each work position in terms of mission, profile, responsibilities, knowledge and competencies.

13.3.1 Management Board

The Management Board will be in charge of deciding the main strategic lines of the company. It is composed by the 5 initial founders of the company, who will initially own the total amount of shares of the company.

- Mission: Make sure that AIRFID S.L. is on the right hands to achieve its main strategic goals.
- Responsibilities: Take decisions over the most important issues of the performance of the company.
- Knowledge: Know the market with a realistic vision over the future of the company.
- Competencies: Capability to adapt to the changing environment.

13.3.2 General Manager

- Mission: Lead AIRFID S.L. to the biggest possible success.
- Profile: Person with business background that knows the RFID technology.
- Responsibilities: Take care of the supervision of all the business units and track the achievement of all the set objectives.
- Knowledge: Master in Business Administration required, as well as business experience. Knowledge of the aeronautic sector.
- Competencies: High social skills. Ability to negotiate.

The selected person for this position is Carlos Sánchez Cazorla. He is a Telecommunications Engineer with an Aerospace MBA in the EOI Business School in Seville. He has been running a Consultancy company for the last 4 years and has worked for a year in the Subcontracting department of Airbus Military in Tablada. He has worked as software developer in ELIMCO and in a Swedish VoIP company in Stockholm. Moreover, he spent a year as an instrumentation and control supervisor for Abengoa Solar.

13.3.3 Commercial Manager

- Mission: Obtain the largest amount of contracts with the biggest possible margin.
- Profile: Person with business background in terms of commercial activities.
- Responsibilities: Negotiate the contracts with the different customers. Search for new contracts.
- Knowledge: Master in Business Administration required.
- Competencies: Ability to apply marketing concepts. High social and persuasive skills.

The selected person for this position is Jesús Garrido Molinero, a Physicist and Material Engineer with an Aerospace MBA in the EOI Business School in Seville. He has worked during the last year in the Quality department in Tablada Production Center of Airbus Military. Hence, he has ability to understand the customer's requirements in terms of standards that need to be met or in terms of procedures of implantation that may be desired.

13.3.4 Software Engineer

- Mission: Develop the most reliable and flexible software.
- Profile: Telecommunications or IT Engineer.
- Responsibilities: Understand the customer's requirements and develop a product according to them. Optimize the relationship between different modules developed in order to have an efficient standard.
- Knowledge: Technical background with experience in different programming languages, as C, C++ and Java.
- Competencies: Ability to work under pressure. Social skills to make the relationship with the Commercial and Production departments as easy and efficient as possible.

The selected person for this position is Humberto Astudillo Mendinueta, a Telecommunications Engineer with an Aerospace MBA in the EOI Business School in Seville. He has a technical background in the field of RFID technology, which he studied during 2 years in the CEIT research center in San Sebastián, Guipúzcoa. Moreover, he did his Master Thesis in the Fraunhofer Institute FOKUS, in Berlin, in the implementation of a new Internet Protocol.

13.3.5 Systems Engineer

- Mission: Make the most of the mixture of hardware and software.
- Profile: Electronic Engineer.
- Responsibilities: Design and test the different RFID modules. Analyze the customer requirements and have a close relationship with the Production Engineer, the Software Engineer and the Commercial Manager.
- Knowledge: Experience installing electric systems. High technical skills required.
- Competencies: Ability to work under pressure. High motivation and social skills. Ability to teach.

The selected person for this position is José María Álvarez Hiraldo, an Electronic Engineer with an Aerospace MBA in the EOI Business School in Seville. He has a high technical background in the field of systems design and testing due to his work experience in the Systems Department of the Production Engineering area of Airbus Military. During his year in this company he was able to understand in depth the electric systems of the C-295 and CN-235 aircrafts. Moreover, he was elected to teach several seminars over the different electric systems of an aircraft to other employees of the company.

13.3.6 Production Engineer

- Mission: Install the products with the highest level of precision and client satisfaction in the lowest amount of time.
- Profile: Industrial Engineer.
- Responsibilities: Implementation of the different RFID solutions. Purchase of equipment and customer support.
- Knowledge: Technical and Commercial Skills. Knowledge about the aeronautic sector.
- Competencies: Organized person capable to stick to an end date and achieve it.

The selected person for this position is Daniel Portela Romero, an Industrial Engineer with an Aerospace MBA in the EOI Business School in Seville. He has several work experiences: last year he has worked in the Production Engineering Department of Airbus Military in charge of optimizing the production process, and previously he worked for 2 years in *Prefabricados Técnicos del Sur* as the Production Manager in charge of the design and assembly of the production line among other functions.

He is used to working with several schedule programs and has acquired a deep knowledge over Lean manufacturing, which is currently being introduced in the Aeronautic Sector.

13.3.7 Technicians

- Mission: Develop software and systems and install the modules with the highest efficiency.
- Profile: Technical Engineer in Electronics, Telecommunications or IT.
- Responsibilities: Software developers and system testers.
- Knowledge: High technical skills. Experience with systems and programming.
- Competencies: Multi-role person able to change of position according to the company's needs.

A certain amount of technicians will be hired for the different areas of the company. It is likely that some of them might need to change of activity according to the workload. For example, if a complicated customization of the product in terms of software is needed, some will need to work with the Software Engineer. The same would happen with a complicated hardware installation or a high volume contract with a close delivery time.

13.3.8 Trainees

- Mission: Give support to each of the departments.
- Profile: Graduated with no more than 2 years of work experience
- Responsibilities: Give support to the different departments.
- Knowledge: Commercial activities, production, programming or electronics.
- Competencies: Social person with organization and interest in learning.

A certain amount of trainees will be hired to give support to the different departments and as a possible way of entering the company with a better contract. It is a way to test and improve the different formation systems of the company without spending a significant amount of money, and it is a good opportunity to detect people with high potential for the different activities where more workload is expected.

13.4 Staff Planning

According to the the estimated planning from the Operations Plan, it will be necessary to hire certain amount of employees. Until the first contract, no extra staff will be hired, but from this moment on new incorporations are expected. Around month number 4, 3 technicians and a trainee will be hired to work part-time under the supervision and coordination of the Production Manager. However, it is possible that they are asked to give support to the Design & Engineering Department if some more help is needed.

In year 2, there will not be any new incorporations as the company will concentrate on settling down its structure. Its capacity is enough to face the expected number of projects contracted, but in case more resources are needed, they will hire another technician and a full- time engineer. It may be possible that the trainee from the first year is hired as a commercial or a technician depending on his performance. If so, another trainee will be hired.

In year 3 another technician will join the company to deal with the increasing load expected, and the same will happen in years 4 and 5, when 2 engineers and a technician will be hired. By this pattern, the company will grow in a sustainable way and will be able to accept more complex projects.

Figure 13.3 shows the evolution of the staff in the first 5 years of AIRFID S.L. by type of employee.

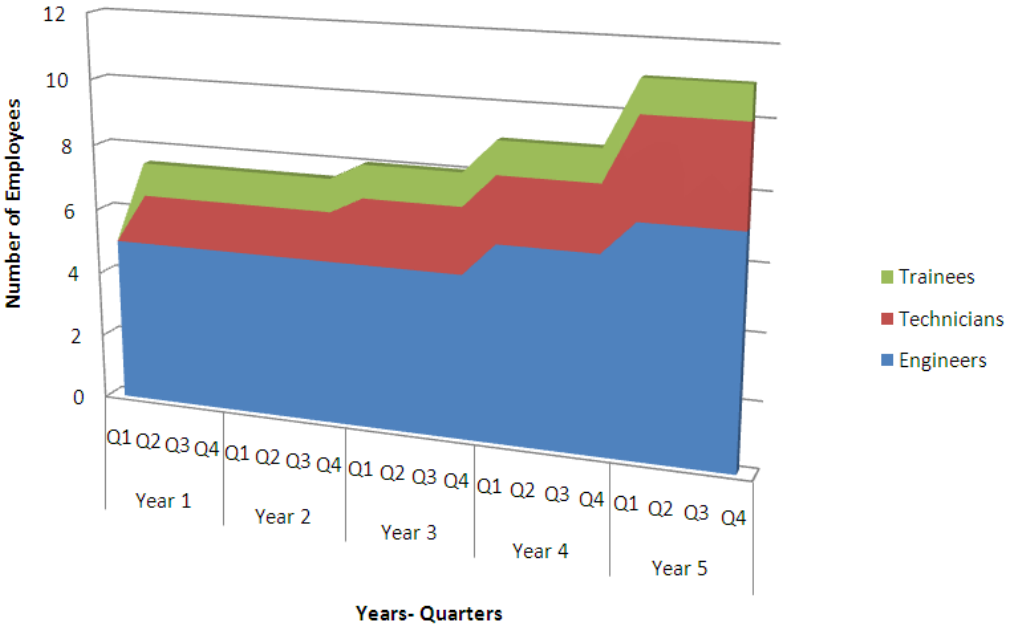

Figure 13.3: 5 Year Staff Planning

13.5 Remuneration Policies

A company can be easily characterized by their remuneration policies: a leader company will pay much more because it doesn't want to lose their probable key element: their workforce, while a new company will not probably have the same economic capabilities.

Apart from this, a traditional approach of remuneration is the fixed salary, which gives a lot of feeling of security in the worker, while a more aggresive model is based on a certain variable salary, which might bring better results due to the higher motivation and some more stress.

Another variable to take into account is the possibility to pay for the achievement of individual targets or for collective targets. Individual targets might work better when the different performances are standard, as every one will push for their interests and make the most of them. However, a collective target leads to more cooperation among workers, as they will all be aware of the fact that they have a common goal to reach. This may be possitive if they keep their motivation but may become negative if some workers are not capable of having the desired positive effect on the least productive employees.

The remuneration policies could be described as follows:

13.5.1 Types of Remunerations

As it has been mentioned, these are the different parameters of remuneration that are going to be applied:

- Fixed salary: To start with, AIRFID will not offer high salaries due to the difficult financial situation at the beginning of a start-up company. However, it will be stated that in the future the fixed amount of salary will be revised according to the company's performance.
- Variable salary: A significant amount of the paid salaries will depend on the amount of sales performed. Apart from this, each department will fix certain objectives that could be tangible to measure. Every department will have different objectives, which will be shared by all its members.

13.5.2 Bonus on Objectives

As mentioned above, there will be bonuses on objectives for each worker. The bonus (maximum percentage of the fixed salary) of each position will depend on the level of responsibility of the worker, as it is shown below:

Levels	Positions	Max Bonus
Level 1	Senior Manager	50%
Level 3	Commercial Manager	50%
Level 2	Engineers	40%
Level 4	Technicians	20%
Level 5	Trainees	20%

Table 13.1: Bonus on Objectives

13.5.3 Staff Cost

Once the percentage of bonus on objectives has been defined, it still remains to state the fixed salary that each worker will receive. This, together with the variable salary, will make the gross salary of each employee, which doesn't necessarily mean that this is the amount that they will receive.

Table 13.5.3 shows the different salary levels, while Table 13.5.3 states the maximum salaries for each level.

Levels	Positions	Fixed Salary
Level 1	General Manager	17000€
Level 3	Commercial Manager	17000€
Level 2	Engineers	15000€
Level 4	Technicians	15000€
Level 5	Trainees	5000€

Table 13.2: Fixed Salaries

Levels	Positions	Max Salary
Level 1	General Manager	25500€
Level 3	Commercial Manager	25500€
Level 2	Engineers	21000€
Level 4	Technicians	18000€
Level 5	Trainees	6000€

Table 13.3: Maximum Gross Salaries

Now it is time to obtain the staff cost, which is the total amount of money that the company will pay for their employees.

The gross salary covers the following expenses of each employee:

- IRPF retention: money paid as taxes to the Spanish State. It varies according to the level of income, ranging from the 16 % for Technicians and 18% for the salary of the Senior Manager. The trainees would not pay any money associated to this concept.
- Social Security retention: It has a fixed value of 6,35%, as a result of the following concepts:
  - Common contingencies: 4,70%
  - Unemployment: 1,55%
  - Professional training (FP): 0,10%

The company must also pay an extra amount of money for these same concepts, which is added to the gross salaries to obtain the total staff cost of each employee.

- Common contingencies: 23,60%
- Unemployment: 5,5%
- Professional training (FP): 0,60%
- FOGASA (Social Guarantee Fund): 0,20%

Therefore, the total percentage applicable is 30,15% [41]. The following table shows the maximum staff cost of the different categories:

Levels	Positions	Staff Cost
Level 1	Senior Manager	33200€
Level 3	Commercial Manager	33200€
Level 2	Engineers	27300€
Level 4	Technicians	23400€
Level 5	Trainees	7800€

Table 13.4: Maximum Staff Costs.

The total amount of staff cost varies throughout the the first years of AIRFID S.L. , and it is calculated in the Financial Plan of Chapter 14. In this Chapter 3 different scenarios are foreseen, and according to the success of the company, it will hire more workers or lower or increase the salaries.

13.5.4 Future Remuneration Plans

The described salaries are bound to change according to the overall performance of AIRFID. Each year end, remuneration policies will be reviewed to adapt them to the market in order to be competitive. However, the described mixture of fixed and variable salaries will probably remain as it is a good way to keep motivation and to make employees do their best.

13.6 Other Human Resources Policies

Apart from the described sections, there are many other aspects that a Human Resources Plan should cover. This section gives an overview of the different measures that will be taken in several important fields of the everyday's life of AIRFID S.L.

13.6.1 Formation

Formation is an essential factor in the success of a new company. Therefore, each position will need to take several formation courses that will be given by entities like the Chamber of Commmerce or the CEA (*Confederación de Empresarios de Andalucía*). These courses are normally subventioned by the Regional Government. The total annual budget on formation is estimated around 3000€.

Apart from this, it is important to mention the figure of the mentor. This person will be in charge of the formation of new employees, to follow

their first steps closely and to help them in any problem or doubt they may have. For the first hired employees, founding members will have the role of mentors, while for the following incorporations it will depend on the degree of implication and performance of the existing employees. Trainees will directly be mentored by technicians, but all the employees will be responsible of their quick and effective adaptation.

13.6.2 Research & Development

AIRFID is committed with the new technologies because this is the way to keep the competitive advantage over the market rivals. For this reason, each employee should spend 15% of the working hours on tasks related with Research & Development.

13.6.3 Selection Processes

The selection process will be lauched by the Management Board, which will decide the prerequisites that the demandants must have and the requirements for the position to be covered. After this, the engineer responsible of the department will be in charge of doing the necessary interviews to fill the vacancy. For the first positions it is thought that the contact networks of the employees will offer a significant amount of reliable applicants, but in the future the possibility of contacting a recruitment agency will be considered.

13.6.4 Performance Evaluation

Measuring the performance of each employee is a key element for the performance improvement. This may seem an obvious matter but it can result in a huge impact on the company's overall performance. Hence, as it has been mentioned before, a significant part of the salary will be variable according to the fulfilment of the targets set by their direct responsible.

These targets will be set according to the company's expectations on sales and on the employee's potential. They will be totally tangible targets, like amount of sales, number of new clients, hours of programming required, number of complaints from the client etc.

13.6.5 Motivation

AIRFID S.L. wants to keep all the staff motivated. Therefore, it has been thought that short-term goals are also going to be set and extra activities will be performed with regularity. For example, the company will sponsor a football team so that the employees will have a closer relationship with each

other and in order to improve the quality of the teamwork. This will have an annual cost of around 800€, but there will be a clear positive impact on the motivation of workers as well as on the income statement.

13.6.6 Timetable

There will be no fixed timetable, as some "time windows" will be stated. People will work an average of 8 hours a day, and it is not important when they work as long as it is within the folllowing "windows":

- Entrance: between 8am and 10am.
- End: between 5pm and 7pm.

All the meetings should be held between 10am and 12am or between 3pm to 5pm, so that any worker can assist. However, it is important to state that what has been stated can change to suit the client's needs or as a response of extra requirements.

With regard to extra hours, it is expected that they will be needed in the first months of the company, but they won't be paid as a result of the weak initial financial position of AIRFID S.L. However, staff will never work more than 60 extra hours a month.

13.6.7 Holidays

Each worker will have the right to take 22 days of vacation every year, apart from the national festivities. However, as the Andalusian aeronautic sector normally stops in August, half of the holidays will be taken in this month and the rest will be selected by each worker. They can split these 11 days in as many periods as they wish, as long as they take into consideration the different commitments of the enterprise.

13.6.8 Subcontracting

As mentioned in other chapters, some services will be subcontracted, as the fiscal, legal and labour consultancy. This is done by a local account company with a monthly fee of 400€.

Chapter 14

Financial Plan

14.1 Introduction

In this chapter, the financial plan of AIRFID S.L. will be explained in depth.

It has been considered a five-year forecast to analyze the feasibility of this company; from July 2010 until July 2015. During the first two years the cash flow analysis has been developed in a monthly basis, in order to ensure the correct operation at the beginning, when the investment is huge and the revenues usually are short.

Our company aim is to get a certain amount of projects every year, but we cannot assure that will happen, consequently three different scenarios have been developed: pessimistic (1), probable (2) and optimistic (3). The differences are the number of projects under contract, and as a consequence salaries, capacity, expenses, income and so on. In all the scenarios, at least one contract will be signed per year and it will increase year by year in a different way, according to our estimations.

All the financial data is explained into the following sections. The cash flow monthly details and some other information regarding personnel expenses, milestones, etc. will be attached as tables at the end of this chapter.

14.2 Financial objectives

AIRFID S.L. financial objectives are described in Chapter 10 (Strategic Objectives). Anyway, we will remind them here:

- To reach a level of sales of 1,5M€in five years, according to the sector average.
- To get a ROE between 12% and 16% in five years.

- To get a minimum ROI of 12% by year five.

The following sections in this Financial Plan will support these objectives.

14.3 Estimations

In this chapter, some estimations are presented, on which all the numbers in the financial plan have been based. We have estimated for each scenario and according to the market research developed in the marketing plan, a workload, and as a consequence a number of employees. These data is shown in table 14.1. Information relative to CPI, VAT, etc. used in all the estimations is shown in Table 14.3 on page 248.

Regarding operational factors we have considered the following:

- Average collection period: 90 days.
- Average payment period: 90 days.
- Working days per year: 211.
- Absentism: 5%.
- Time devoted to training: 15%.
- Time devoted to R&D: 15%
- Initial capital: 100.000€.
- Financial needs apart from shareholders capital: 100.000€(Amount decision explained in the Funding Needs and Cash Flow sections).
- Loan amortization: 5 years.
- Loan interest rate: 5%
- Loan grace period: 1 year

Table 14.4 resumes the amount of hours needed in order to develope each one of the four modules (one basic plus three specific) that AIRFID S.L. will develope during the first two years of operation. A detailed break-down of each module can be found in the Operation Plan chapter.

Table 14.5 reflects real cost (excluding VAT) for the necessary equipment that we will use in our projects, and table 14.2 the margin we will charge over equipment and operational costs. Margin applied on equipment is below the market average in order to gain competitiveness during the first years of operation. Margin applied on operational costs are calculated in order not to exceed the sector average hourly price. These figures are shown in Table 14.2 for the different scenarios.

	SCENARIO 1					SCENARIO 2					SCENARIO 3				
	Y1	Y2	Y3	Y4	Y5	Y1	Y2	Y3	Y4	Y5	Y1	Y2	Y3	Y4	Y5
Engineers	3	3	3	3	3	3	3	3	4	5	3	4	5	5	6
General Manager	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Commercial	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2
Technicians	1.5	0	0	1.5	1.5	1.5	1.5	2	2	3	1.5	2	2	2.5	3
Projects	1	1	2	3	4	2	3	4	5	6	2	4	5	6	8
Trainees	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Table 14.1: Estimations for the different scenarios

	SCENARIO 1					SCENARIO 2					SCENARIO 3				
	Y1	Y2	Y3	Y4	Y5	Y1	Y2	Y3	Y4	Y5	Y1	Y2	Y3	Y4	Y5
Equipment	7%	7%	8%	8%	9%	7%	7%	8%	8%	9%	7%	9%	10%	11%	11%
Operational	15%	16%	17%	18%	20%	15%	19%	22%	23%	25%	15%	19%	23%	27%	30%

Table 14.2: Margins for the different scenarios

Hypothesis	Y1	Y2	Y3	Y4	Y5
Consumer price index (CPI)	0.7%	0.8%	0.9%	1.0%	1.2%
Investments interest	0.9%	0.9%	0.9%	0.9%	0.9%
Borrowings interest	7.0%	7.0%	7.0%	7.0%	7.0%
VAT	18.0%	18.0%	18.0%	18.0%	18.0%

Table 14.3: Hyphotesis for the different scenarios

Modules	Type A	Type B	Type C	Type D
RIM hours design	835	835	835	835
ACM hours design	334	334	-	-
ELM hours design	292	-	292	-
FPM hours design	376	-	-	376
Total hours design	**1837**	**1169**	**1127**	**1211**
Implementation (35%)	643	409	395	424
Total project hours	**2480**	**1578**	**1522**	**1635**

Table 14.4: Module design by hours

Equipment prices	
Tag type 1	2 €
Tag type 2	3 €
Antenna	120 €
Fixed reader	1,300 €
Portable reader	2,000 €
Tag printer	1,800 €

Table 14.5: Equipment prices

14.4 Personnel costs and Capacity

Just to serve as a baseline for the personnel costs calculations, table 14.6 on page 250 shows an estimation on the salaries increase according to each scenario. For instance, in the pessimistic scenario, we will see a very bad evolution during the first year, and as a consequence, salaries decrease in the second year in that scenario, and as the company starts to improve, they start to grow up again.

Tables 14.8, 14.9, 14.10 show the information regarding personnel costs by scenario and broken down in years. Personnel positions are identified as follows:

- GM: General Manager.
- CM: Commercial Manager.
- ENG: Engineer.
- TEC: Technician.
- TRA: Trainee.

For each scenario/year, the following data is shown:

- **ATS**: Absolute Total Salary: is the addition of the fixed part and the variable part for the total number of employees that represent one position, so, it represents salaries costs without considering "Seguridad Social" costs.
- **SS**: is the total amount of money to be paid as "Seguridad Social" for all the employees in that position. For a single employee, that amount is 30.15% of the total salary, with a maximum of 39.000€.
- **Total**: represents the addition of ATS and SS, and thus, the total amount of money to pay for all the employees holding a specific position in the company.

Salaries are upgraded every year, for each scenario, according to the assumptions and estimations for salaries increase shown in Table 14.6. The first year, total cost is the same for every scenario, but for instance, in the case that we finish this first year in the pessimistic scenario situation, the company will reduce capacity in order to adapt to the real demand, and thus, total personnel cost will decrease. When the workload increases, capacity will be increased again. In the other scenarios, capacity increases every year as workload increases too.

Table 14.7 shows capacity as a result of the unitary employee capacity (1688h/year) and the number of employees for each position. Gross capacity

	SCENARIO 1					SCENARIO 2					SCENARIO 3				
	Y1	Y2	Y3	Y4	Y5	Y1	Y2	Y3	Y4	Y5	Y1	Y2	Y3	Y4	Y5
General Manager	0%	-30%	1%	1%	1%	0%	5%	5%	5%	5%	0%	10%	10%	10%	10%
Comercial Manager	0%	-30%	1%	1%	1%	0%	5%	5%	5%	5%	0%	10%	10%	10%	10%
Engineers	0%	-30%	1%	1%	1%	0%	5%	5%	5%	5%	0%	10%	10%	10%	10%
Technicians	0%	-30%	1%	1%	1%	0%	5%	5%	5%	5%	0%	10%	10%	10%	10%
Trainees	0%	-30%	1%	1%	1%	0%	5%	5%	5%	5%	0%	10%	10%	10%	10%

Table 14.6: Salaries increase for the different scenarios

	SCENARIO 1					SCENARIO 2					SCENARIO 3				
	Y1	Y2	Y3	Y4	Y5	Y1	Y2	Y3	Y4	Y5	Y1	Y2	Y3	Y4	Y5
Engineers	5064	5064	5064	5064	5064	5064	5064	5064	6752	8440	5064	6752	8440	8440	10128
Technicians	2532	0	0	2532	2532	2532	2532	3376	3376	5064	2532	3376	3376	4220	5064
Trainees	1688	1688	1688	1688	1688	1688	1688	1688	1688	1688	1688	1688	1688	1688	1688
Gross capacity	9284	6752	6752	9284	9284	9284	9284	10128	11816	15192	9284	11816	13504	14348	16880
Absenteeism	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
R&D	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Professional	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Net capacity	**6035**	**4389**	**4389**	**6035**	**6035**	**6035**	**6035**	**6583**	**7680**	**9875**	**6035**	**7680**	**8778**	**9326**	**10972**

Table 14.7: Labour capacity for the different scenarios

	Year 1			Year 2			Year 3			Year 4			Year 5		
Job	**ATS**	**SS**	**Total**	**ATS**	**SS**	**Total**	**ATS**	**SS**	**Total**	**ATS**	**SS**	**Total**	**ATS**	**SS**	**Total**
GM	17,000 €	5,126 €	22,126 €	11,900 €	3,588 €	15,488 €	12,019 €	3,624 €	15,643 €	15,174 €	4,575 €	19,749 €	15,326 €	4,621 €	19,946 €
CM	17,000 €	5,126 €	22,126 €	11,900 €	3,588 €	15,488 €	12,019 €	3,624 €	15,643 €	15,174 €	4,575 €	19,749 €	15,326 €	4,621 €	19,946 €
ENG	45,000 €	13,568 €	58,568 €	31,500 €	9,497 €	40,997 €	31,815 €	9,592 €	41,407 €	38,560 €	11,626 €	50,186 €	38,945 €	11,742 €	50,687 €
TEC	22,500 €	6,784 €	29,284 €	0 €	0 €	0 €	0 €	0 €	0 €	17,673 €	5,328 €	23,002 €	17,850 €	5,382 €	23,232 €
TRA	5,000 €	1,508 €	6,508 €	3,500 €	1,055 €	4,555 €	3,535 €	1,066 €	4,601 €	3,927 €	1,184 €	5,111 €	3,967 €	1,196 €	5,163 €

Table 14.8: Salary table for scenario 1

	Year 1			Year 2			Year 3			Year 4			Year 5		
Job	**ATS**	**SS**	**Total**	**ATS**	**SS**	**Total**	**ATS**	**SS**	**Total**	**ATS**	**SS**	**Total**	**ATS**	**SS**	**Total**
GM	17,000 €	5,126 €	22,126 €	26,775 €	8,073 €	34,848 €	28,114 €	8,476 €	36,590 €	29,519 €	8,900 €	38,420 €	30,995 €	9,345 €	40,341 €
CM	17,000 €	5,126 €	22,126 €	26,775 €	8,073 €	34,848 €	28,114 €	8,476 €	36,590 €	29,519 €	8,900 €	38,420 €	30,995 €	9,345 €	40,341 €
ENG	45,000 €	13,568 €	58,568 €	66,150 €	19,944 €	86,094 €	69,458 €	20,941 €	90,399 €	97,241 €	29,318 €	126,559 €	127,628 €	38,480 €	166,108 €
TEC	22,500 €	6,784 €	29,284 €	28,350 €	8,548 €	36,898 €	39,690 €	11,967 €	51,657 €	41,675 €	12,565 €	54,239 €	65,637 €	19,790 €	85,427 €
TRA	5,000 €	1,508 €	6,508 €	6,300 €	1,899 €	8,199 €	6,615 €	1,994 €	8,609 €	6,946 €	2,094 €	9,040 €	7,293 €	2,199 €	9,492 €

Table 14.9: Salary table for scenario 2

	Year 1			Year 2			Year 3			Year 4			Year 5		
Job	**ATS**	**SS**	**Total**	**ATS**	**SS**	**Total**	**ATS**	**SS**	**Total**	**ATS**	**SS**	**Total**	**ATS**	**SS**	**Total**
GM	17,000 €	5,126 €	22,126 €	28,050 €	8,457 €	36,507 €	30,855 €	9,303 €	40,158 €	33,941 €	10,233 €	44,174 €	37,335 €	11,256 €	48,591 €
CM	17,000 €	5,126 €	22,126 €	28,050 €	8,457 €	36,507 €	30,855 €	9,303 €	40,158 €	67,881 €	20,466 €	88,347 €	74,669 €	22,513 €	97,182 €
ENG	45,000 €	13,568 €	58,568 €	92,400 €	27,859 €	120,259 €	127,050 €	38,306 €	165,356 €	139,755 €	42,136 €	181,891 €	184,477 €	55,620 €	240,096 €
TEC	22,500 €	6,784 €	29,284 €	39,600 €	11,939 €	51,539 €	43,560 €	13,133 €	56,693 €	59,895 €	18,058 €	77,953 €	79,061 €	23,837 €	102,898 €
TRA	5,000 €	1,508 €	6,508 €	6,600 €	1,990 €	8,590 €	7,260 €	2,189 €	9,449 €	7,986 €	2,408 €	10,394 €	8,785 €	2,649 €	11,433 €

Table 14.10: Salary table for scenario 3

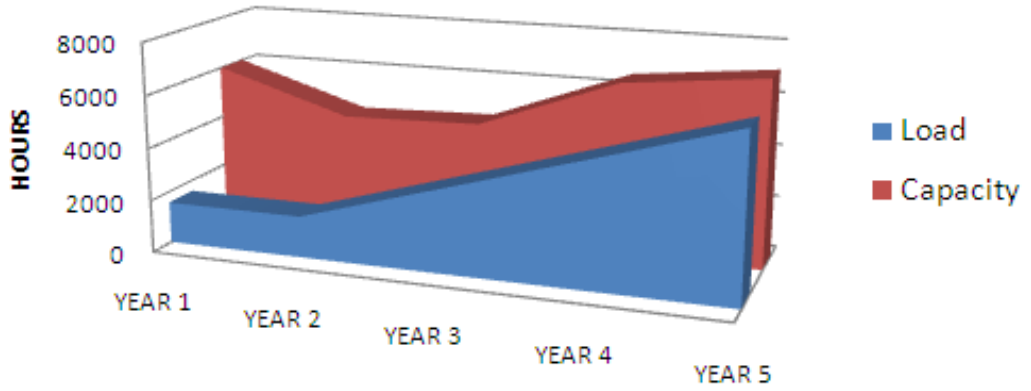

Figure 14.1: Load-Capacity for scenario 1

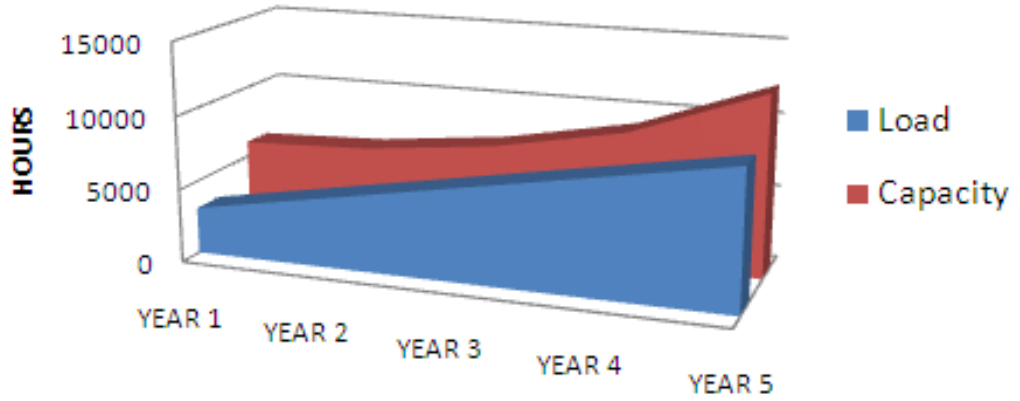

Figure 14.2: Load-Capacity for scenario 2

is diminished by absentism, training hours (15%) and R&D hours (15%) in order to obtain a net capacity dedicated to develop new projects, and get a unitary hour cost according to that. This cost is the basic calculation for project prices and thus, sales forecast.

Figures 14.1, 14.2, 14.3 show load/capacity curves for pessimistic, probable and optimistic scenario respectively. In the pessimistic scenario, due to the low workload, we can see clearly a reduction in capacity, in order to get closer to real workload.

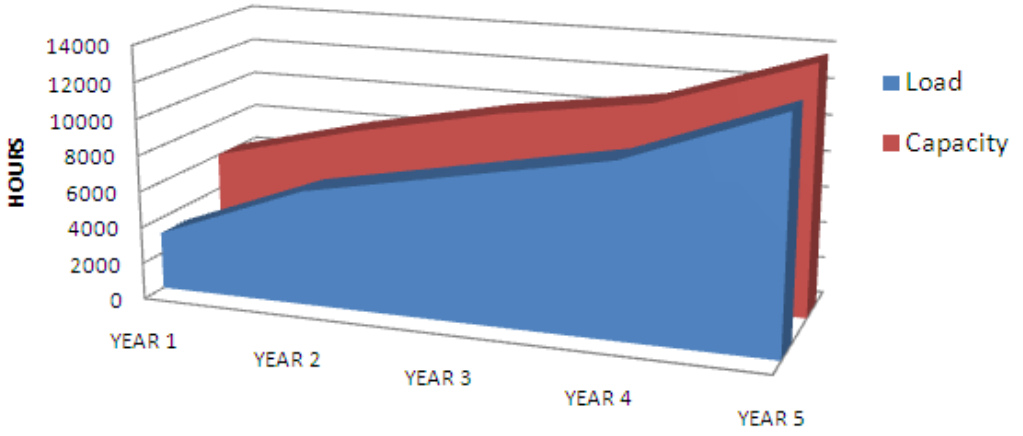

Figure 14.3: Load-Capacity for scenario 3

14.5 Expected costs and Sales

In order to determine an accurate price for our products/services, costs have been thoroughly studied. We have divided cost in two types:

- **Fixed costs:** are all those costs that will remain constant independently on the number of projects contracted.
- **Variable costs:** are all those costs susceptible of variation depending on of projects contracted, as for instance, the number of employees and all costs associated to them (mobile phones, laptops, etc.)

These costs have been calculated according to the number of projects contracted for each scenario (except fixed costs), number of employees, unitary cost for each line and CPI according to estimations. Table 14.12 shows fixed costs that AIRFID S.L. will have, and Tables 14.13, 14.14, 14.15 on page 255 show variable costs for pessimistic, probable and optimistic scenario respectively. As we can see, variable costs for pessimistic scenario decrease in the second year respect to the first year, due to the need of adapting the capacity to the workload. In the other two scenarios, these costs increase year after year, as workload and capacity are better matched, and in consequence it's not necessary to adjust it.

Initial Investment	Cost	Quantity	Total
Start-up expenses	800 €	1	800 €
Software	1,000 €	5	5,000 €
Tag type 1	2 €	20	40 €
Tag type 2	3 €	20	60 €
Antenna	120 €	8	960 €
Fixed reader	1,300 €	2	2,600 €
Portable reader	2,000 €	2	4,000 €
Tag printer	1,800 €	1	1,800 €
Others	1,000 €	1	1,000 €
Total			**16,260 €**

Table 14.11: Initial investment

Fixed cost	Y1	Y2	Y3	Y4	Y5
Office renting	4,200 €	4,234 €	4,272 €	4,314 €	4,366 €
airfid.es hosting	30 €	30 €	31 €	31 €	31 €
Account manager	4,800 €	4,838 €	4,882 €	4,931 €	4,990 €
Training	3,000 €	3,024 €	3,051 €	3,082 €	3,119 €
Office supplies	360 €	363 €	366 €	370 €	374 €
Other expenses	600 €	605 €	610 €	616 €	624 €
Total	**12,990 €**	**13,094 €**	**13,212 €**	**13,344 €**	**13,504 €**

Table 14.12: Fixed cost

Variable cost	Y1	Y2	Y3	Y4	Y5
Mobile phone line	1,800 €	1,800 €	1,800 €	1,800 €	1,800 €
Renting vehicle	3,600 €	3,600 €	3,600 €	3,600 €	3,600 €
Oil bills	1,200 €	1,200 €	1,200 €	1,200 €	1,200 €
Technicians trip	540 €	0 €	0 €	540 €	540 €
Customer meetings	600 €	600 €	1,200 €	1,800 €	2,400 €
Labours	138,610 €	76,528 €	77,293 €	117,797 €	118,975 €
Laptop leasing	3,000 €	3,000 €	3,000 €	3,000 €	3,000 €
Total	149,350 €	86,728 €	88,093 €	129,737 €	131,515 €

Table 14.13: Variable cost for scenario 1

Variable cost	Y1	Y2	Y3	Y4	Y5
Mobile phone line	1,800 €	1,800 €	1,800 €	2,160 €	2,520 €
Renting vehicle	3,600 €	3,600 €	3,600 €	3,600 €	3,600 €
Oil bills	1,200 €	1,200 €	1,200 €	1,200 €	1,200 €
Technicians trip	540 €	540 €	720 €	720 €	1,080 €
Customer meetings	1,200 €	1,800 €	2,400 €	3,000 €	3,600 €
Labours	138,610 €	200,887 €	223,845 €	266,677 €	341,708 €
Laptop leasing	3,000 €	3,000 €	3,000 €	3,600 €	4,200 €
Total	149,950 €	212,827 €	236,565 €	280,957 €	357,908 €

Table 14.14: Variable cost for scenario 2

Variable cost	Y1	Y2	Y3	Y4	Y5
Mobile phone line	1,800 €	2,160 €	2,520 €	2,880 €	3,240 €
Renting vehicle	3,600 €	3,600 €	3,600 €	7,200 €	7,200 €
Oil bills	1,200 €	1,200 €	1,200 €	2,400 €	2,400 €
Technicians trip	540 €	720 €	720 €	900 €	1,080 €
Customer meetings	1,200 €	2,400 €	3,000 €	3,600 €	4,800 €
Labours	138,610 €	253,402 €	311,813 €	402,759 €	500,201 €
Laptop leasing	3,000 €	3,600 €	4,200 €	4,800 €	5,400 €
Total	149,950 €	267,082 €	327,053 €	424,539 €	524,321 €

Table 14.15: Variable cost for scenario 3

Hour cost	Y1	Y2	Y3	Y4	Y5
Investment	5,487 €	11,353 €	11,353 €	17,600 €	11,733 €
Fixed cost	12,990 €	13,094 €	13,212 €	13,344 €	13,504 €
Variable cost	149,350 €	86,728 €	88,093 €	129,737 €	131,515 €
Capacity	6,035 €	4,389 €	4,389 €	6,035 €	6,035 €
Total	27.81 €	25.33 €	25.67 €	26.63 €	25.98 €

Table 14.16: Hour cost for scenario 1

Hour cost	Y1	Y2	Y3	Y4	Y5
Investment	5,487 €	11,353 €	11,353 €	17,600 €	11,733 €
Fixed cost	12,990 €	13,094 €	13,212 €	13,344 €	13,504 €
Variable cost	149,950 €	212,827 €	236,565 €	280,957 €	357,908 €
Capacity	6,035 €	6,035 €	6,583 €	7,680 €	9,875 €
Total	27.91 €	39.32 €	39.67 €	40.61 €	38.80 €

Table 14.17: Hour cost for scenario 2

14.6 Hour cost estimation

With these costs broken down and considering the net capacity calculated in Table 14.7, we obtain an hour cost. These hour costs are shown on page 256 for each scenario in Tables 14.16, 14.17, 14.18. These costs will be charged according to the margins on operations shown in Table 14.2, that was explained previously.

Equipment costs have been calculated using as a basis a Type B project equipment. Tables 14.19, 14.20, 14.21 show the total expenditure in equipment for each scenario and year. To calculate these amounts we have considered the number of projects and the unitary cost for the equipment of a project. These costs are charged according to the margins on equipment shown in Table 14.2.

The addition of operational and equipment costs forecast increased by the margins, will provide us our sales forecast, as shown on page 258 in Tables 14.22, 14.23 and 14.24 for each scenario and year.

Hour cost	Y1	Y2	Y3	Y4	Y5
Investment	5,487 €	11,353 €	11,353 €	17,600 €	11,733 €
Fixed cost	12,990 €	13,094 €	13,212 €	13,344 €	13,504 €
Variable cost	149,950 €	267,082 €	327,053 €	424,539 €	524,321 €
Capacity	6,035 €	7,680 €	8,778 €	9,326 €	10,972 €
Total	27.91 €	37.96 €	40.06 €	48.84 €	50.09 €

Table 14.18: Hour cost for scenario 3

Equipment	Y1	Y2	Y3	Y4	Y5
Tag type 1	22,000 €	22,000 €	44,000 €	66,000 €	88,000 €
Tag type 2	12,000 €	12,000 €	24,000 €	36,000 €	48,000 €
Antenna	2,400 €	2,400 €	4,800 €	7,200 €	9,600 €
Fix. reader	10,400 €	10,400 €	20,800 €	31,200 €	41,600 €
Port. reader	80,000 €	80,000 €	160,000 €	240,000 €	320,000 €
Printer	1,800 €	1,800 €	3,600 €	5,400 €	7,200 €
Total	128,600 €	128,600 €	257,200 €	385,800 €	514,400 €

Table 14.19: Equipment for scenario 1

Equipment	Y1	Y2	Y3	Y4	Y5
Tag type 1	44,000 €	66,000 €	88,000 €	110,000 €	132,000 €
Tag type 2	24,000 €	36,000 €	48,000 €	60,000 €	72,000 €
Antenna	4,800 €	7,200 €	9,600 €	12,000 €	14,400 €
Fix. reader	20,800 €	31,200 €	41,600 €	52,000 €	62,400 €
Port. reader	160,000 €	240,000 €	320,000 €	400,000 €	480,000 €
Printer	3,600 €	5,400 €	7,200 €	9,000 €	10,800 €
Total	257,200 €	385,800 €	514,400 €	643,000 €	771,600 €

Table 14.20: Equipment for scenario 2

Equipment	Y1	Y2	Y3	Y4	Y5
Tag type 1	44,000 €	88,000 €	110,000 €	132,000 €	176,000 €
Tag type 2	24,000 €	48,000 €	60,000 €	72,000 €	96,000 €
Antenna	4,800 €	9,600 €	12,000 €	14,400 €	19,200 €
Fix. reader	20,800 €	41,600 €	52,000 €	62,400 €	83,200 €
Port. reader	160,000 €	320,000 €	400,000 €	480,000 €	640,000 €
Printer	3,600 €	7,200 €	9,000 €	10,800 €	14,400 €
Total	257,200 €	514,400 €	643,000 €	771,600 €	1,028,800 €

Table 14.21: Equipment for scenario 3

Hypothesis	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Operational	50,473 €	46,373 €	94,794 €	148,753 €	196,768 €
Equipment	137,602 €	137,602 €	277,776 €	416,664 €	560,696 €
Subtotal	188,075 €	183,975 €	372,570 €	565,417 €	757,464 €
VAT	33,853 €	33,116 €	67,063 €	101,775 €	136,343 €
Total	221,928 €	217,091 €	439,633 €	667,192 €	893,807 €

Table 14.22: Sales forecast for scenario 1

Hypothesis	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Operational	101,307 €	221,522 €	305,484 €	394,145 €	459,245 €
Equipment	275,204 €	412,806 €	555,552 €	694,440 €	841,044 €
Subtotal	376,511 €	634,328 €	861,036 €	1,088,585 €	1,300,289 €
VAT	67,772 €	114,179 €	154,986 €	195,945 €	234,052 €
Total	444,283 €	748,508 €	1,016,022 €	1,284,530 €	1,534,341 €

Table 14.23: Sales forecast for scenario 2

Hypothesis	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Operational	101,307 €	285,137 €	388,794 €	587,314 €	822,071 €
Equipment	275,204 €	560,696 €	707,300 €	856,476 €	1,141,968 €
Subtotal	376,511 €	845,833 €	1,096,094 €	1,443,790 €	1,964,039 €
VAT	67,772 €	152,250 €	197,297 €	259,882 €	353,527 €
Total	444,283 €	998,083 €	1,293,391 €	1,703,672 €	2,317,566 €

Table 14.24: Sales forecast for scenario 3

Expected investments	Investment	Years	Depreciation
Software	5,000 €	3	1,667 €
Tag type 1	40 €	3	13 €
Tag type 2	60 €	3	20 €
Antenna	960 €	3	320 €
Fixed reader	2,600 €	3	867 €
Portable reader	4,000 €	3	1,333 €
Tag printer	1,800 €	3	600 €
Tags year 2	2,000 €	3	667 €
Readers year 2	5,000 €	3	1,667 €
Software year 2	7,000 €	3	2,333 €
Printers year 2	2,000 €	3	667 €
Antenna year 2	1,600 €	3	533 €
Tags year 4	4,000 €	3	1,333 €
Readers year 4	10,000 €	3	3,333 €
Software year 4	14,000 €	3	4,667 €
Printers year 4	4,000 €	3	1,333 €
Antenna year 4	3,200 €	3	1,067 €
Others	2,000 €	3	667 €
Total	69,260 €		23,087 €

Table 14.25: Capital Expenditure

14.7 Investment Plan

AIRFID S.L. requires to face an initial investment in order to acquire the necessary equipment to develope the products. These equipment is described in the Operational Plan and Table 14.25 reflects the cost of these equipments, excluding VAT. Due to the nature of the product/service that AIRFID S.L. sells, we expect to invest on new equipment on the second and fourth years. For the equipment described, we have decided a period of amortization of five years. Table 14.26 shows depreciation amounts year by year, according to the amortization period.

Depreciations	2010	2011	2012	2013	2014
Software	1,667 €	1,667 €	1,667 €		
Tag type 1	13 €	13 €	13 €		
Tag type 2	20 €	20 €	20 €		
Antenna	320 €	320 €	320 €		
Fixed reader	867 €	867 €	867 €		
Portable reader	1,333 €	1,333 €	1,333 €		
Tag printer	600 €	600 €	600 €		
Tags year 2		667 €	667 €	667 €	
Readers year 2		1,667 €	1,667 €	1,667 €	
Software year 2		2,333 €	2,333 €	2,333 €	
Printers year 2		667 €	667 €	667 €	
Antenna year 2		533 €	533 €	533 €	
Tags year 4				1,333 €	1,333 €
Readers year 4				3,333 €	3,333 €
Software year 4				4,667 €	4,667 €
Printers year 4				1,333 €	1,333 €
Antenna year 4				1,067 €	1,067 €
Others	667 €	667 €	667 €		
Total	5,487 €	11,353 €	11,353 €	17,600 €	11,733 €

Table 14.26: Depreciation

Net value	2010	2011	2012	2013	2014
Accum Adq. cost	16,460 €	34,060 €	34,060 €	69,260 €	69,260 €
Accum depreciation	5,487 €	16,840 €	28,193 €	45,793 €	57,527 €
Fixed assets	10,973 €	17,220 €	5,867 €	23,467 €	11,733 €
Capex	16,460 €	17,600 €		35,200 €	

Table 14.27: Net value

14.8 Profit and Loss

According to the sales level and operating costs described in previous sections, we present in Tables 14.28, 14.29 and 14.30 a P&L forecast for the first five years of operation. In the pessimistic scenario, AIRFID S.L. starts to be profitable during the third year of operation, and reach and EBIT of 12.9% in the fifth year. In the other scenarios, the company starts to be profitable during the second year and reaches an EBIT over 12.0% in the fifth year.

	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Revenues					
Sales	188,075 €	183,975 €	372,570 €	565,417 €	757,464 €
Expenses					
Labour	138,610 €	76,528 €	77,293 €	117,797 €	118,975 €
Equipment	128,600 €	128,600 €	257,200 €	385,800 €	514,400 €
Start up	800 €		- €	- €	- €
Amortization	5,487 €	11,353 €	11,353 €	17,600 €	11,733 €
Marketing	3,000 €	3,021 €	3,045 €	3,073 €	3,103 €
Structural	23,730 €	23,294 €	24,012 €	25,284 €	26,044 €
EBIT	**- 112,152 €**	**- 58,821 €**	**-333 €**	**15,864 €**	**83,209 €**
Financial					
Cost	500 €	4,474 €	3,289 €	2,043 €	743 €
Income	- €	- €	- €	- €	86 €
EBT	- 117,152 €	- 63,295 €	-3,622 €	13,821 €	82,552 €
Income taxes	29,288 €	15,824 €	906 €	- 3,455 €	- 20,638 €
EAT	**- 87,864 €**	**- 47,471 €**	**- 2,717 €**	**10,365 €**	**61,914 €**
Def. Inc. Tax.	29,288 €	45,112 €	46,017 €	42,562 €	21,924 €
Tax Due	- €	- €	- €	- €	- €
Dividends	- €	- €	- €	- €	- €

Table 14.28: Profit and Loss for scenario 1

	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Revenues					
Sales	376,511 €	634,328 €	861,036 €	1,088,585 €	1,300,289 €
Expenses					
Labour	138,610 €	200,887 €	223,845 €	266,677 €	341,708 €
Equipment	257,200 €	385,800 €	514,400 €	643,000 €	771,600 €
Start up	800 €	- €	- €	- €	- €
Amortization	5,487 €	11,353 €	11,353 €	17,600 €	11,733 €
Marketing	3,000 €	3,021 €	3,045 €	3,073 €	3,103 €
Structural	24,330 €	25,034 €	25,932 €	27,624 €	29,704 €
EBIT	**- 52,916 €**	**8,234 €**	**82,460 €**	**130,612 €**	**142,441 €**
Financial					
Cost	500 €	4,474 €	3,289 €	2,043 €	743 €
Income	- €	- €	- €	86 €	86 €
EBT	- 57,916 €	3,760 €	79,171 €	128,654 €	141,784 €
Income Taxes	14,479 €	- 940 €	- 19,793 €	- 38,596 €	- 42,535 €
EAT	**- 43,437 €**	**2,820 €**	**59,379 €**	**90,058 €**	**99,249 €**
Def. Inc. Taxes	14,479 €	13,539 €	- €	- €	- €
Tax Due	- €	- €	6,254 €	38,596 €	42,535 €
Dividends	- €	- €	- €	5,628 €	41,276 €

Table 14.29: Profit and Loss for scenario 2

	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Revenues					
Sales	376,511 €	845,833 €	1,096,094 €	1,443,790 €	1,964,039 €
Expenses					
Labour	138,610 €	253,402 €	311,813 €	402,759 €	500,201 €
Equipment	257,200 €	514,400 €	643,000 €	771,600 €	1,028,800 €
Start up	800 €	- €	- €	- €	- €
Amortization	5,487 €	11,353 €	11,353 €	17,600 €	11,733 €
Marketing	3,000 €	3,021 €	3,045 €	3,073 €	3,103 €
Structural	24,330 €	26,774 €	28,452 €	35,124 €	37,624 €
EBIT	**- 52,916 €**	**36,883 €**	**98,430 €**	**213,635 €**	**382,578 €**
Financial					
Cost	500 €	4,474 €	3,289 €	2,043 €	743 €
Income	- €	86 €	86 €	86 €	86 €
EBT	- 57,916 €	32,495 €	95,227 €	211,678 €	381,921 €
Income taxes	14,479 €	- 8,124 €	- 23,807 €	- 63,503 €	- 114,576 €
EAT	**- 43,437 €**	**24,371 €**	**71,421 €**	**148,174 €**	**267,345 €**
Def. Inc. Taxes	14,479 €	6,355 €	- €	- €	- €
Tax Due	- €	- €	17,452 €	63,503 €	114,576 €
Dividends	- €	- €	- €	20,942 €	89,794 €

Table 14.30: Profit and Loss for scenario 3

14.9 Balance Sheet Forecast

Tables 14.31, 14.32 and 14.33 show a five-year forecast for the Balance Sheet of AIRFID S.L. in the pessimistic, probable and optimistic scenarios respectively.

In the three scenarios, the borrowing is paid in five years. In the pessimistic scenario, due to the low profits of the company, there are no retained earnings. Also, there is no place to pay income taxes, as the results of the first years create a tax shield that lasts until the fifth year. It does not happen in the other two scenarios, where retained earnings and income taxes appear.

	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Total assets	**120,600 €**	**49,783 €**	**31,206 €**	**24,658 €**	**68,313 €**
Fixed assets	10,973 €	17,220 €	5,867 €	23,467 €	11,733 €
VAT to compensate	7,767 €	7,763 €	12,792 €	20,221 €	24,460 €
Deferred Income Taxes	29,288 €	45,112 €	46,017 €	42,562 €	21,924 €
Short-term investment	- €	- €	- €	10,000 €	10,000 €
Cash	72,572 €	- 20,312 €	- 33,469 €	- 71,591 €	196 €
Total liabilities	**120,600 €**	**49,783 €**	**31,206 €**	**24,658 €**	**68,313 €**
Common stocks	100,000 €	100,000 €	100,000 €	100,000 €	100,000 €
Retained earnings	- €	- €	- €	- €	- €
Net earnings	- 87,864 €	- 47,471 €	- 2,717 €	10,365 €	61,914 €
Accumulated losses	- €	- 87,864 €	- 135,335 €	- 138,052 €	- 127,686 €
Long-term borrowings	100,000 €	76,839 €	52,493 €	26,901 €	€
VAT payable	8,463 €	8,279 €	16,766 €	25,444 €	34,086 €
Income taxes	- €	- €	- €	- €	- €

Table 14.31: Balance Sheet for scenario 1

	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Total assets	**173,506 €**	**164,767 €**	**216,255 €**	**317,675 €**	**362,212 €**
Fixed assets	10,973 €	17,220 €	5,867 €	23,467 €	11,733 €
VAT to compensate	13,581 €	19,415 €	24,452 €	31,900 €	36,198 €
Deferred income taxes	14,479 €	13,539 €	- €	- €	- €
Short-term investment	- €	- €	10,000 €	10,000 €	10,000 €
Cash	134,473 €	114,592 €	175,936 €	252,308 €	304,280 €
Total liabilities	**173,506 €**	**164,767 €**	**216,255 €**	**317,675 €**	**362,212 €**
Common stocks	100,000 €	100,000 €	100,000 €	100,000 €	100,000 €
Retained earnings	- €	- €	- €	13,133 €	61,915 €
Net earnings	- 43,437 €	2,820 €	59,379 €	90,058 €	99,249 €
Accumulated losses	- €	- 43,437 €	- 40,617 €	- €	- €
Long-term borrowings	100,000 €	76,839 €	52,493 €	26,901 €	€
VAT payable	16,943 €	28,545 €	38,747 €	48,986 €	58,513 €
Income taxes	- €	- €	6,254 €	38,596 €	42,535 €

Table 14.32: Balance Sheet for scenario 2

	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Total assets	**173,506 €**	**195,836 €**	**271,624 €**	**434,962 €**	**660,096 €**
Fixed assets	10,973 €	17,220 €	5,867 €	23,467 €	11,733 €
VAT to compensate	13,581 €	25,281 €	30,352 €	38,025 €	48,129 €
Deferred income taxes	14,479 €	6,355 €	- €	- €	- €
Short-term investment	10,000 €	10,000 €	10,000 €	10,000 €	10,000 €
Cash	124,473 €	136,980 €	225,404 €	363,471 €	590,234 €
Total liabilities	**173,506 €**	**195,836 €**	**271,624 €**	**434,962 €**	**660,096 €**
Common stocks	100,000 €	100,000 €	100,000 €	100,000 €	100,000 €
Retained earnings	- €	- €	- €	31,413 €	89,794 €
Net earnings	- 43,437 €	24,371 €	71,421 €	148,174 €	267,345 €
Accumulated losses	- €	- 43,437 €	- 19,066 €	- €	- €
Long-term borrowings	100,000 €	76,839 €	52,493 €	26,901 €	€
VAT payable	16,943 €	38,062 €	49,324 €	64,971 €	88,382 €
Income taxes	- €	- €	17,452 €	63,503 €	114,576 €

Table 14.33: Balance Sheet for scenario 3

	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Sales	33,853 €	33,116 €	67,063 €	101,775 €	136,343 €
Equipment	23,148 €	23,148 €	46,296 €	69,444 €	92,592 €
Investments	2,963 €	3,168 €	- €	6,336 €	- €
Start-up	144 €	- €	- €	- €	- €
Marketing	540 €	544 €	548 €	553 €	559 €
Structural	4,271 €	4,193 €	4,322 €	4,551 €	4,688 €
Net	2,787 €	2,063 €	15,896 €	20,891 €	38,505 €
Payable	33,853 €	33,116 €	67,063 €	101,775 €	136,343 €
To compensate	31,066 €	31,053 €	51,166 €	80,884 €	97,839 €

Table 14.34: VAT calculations for scenario 1

	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Sales	67,772 €	114,179 €	154,986 €	195,945 €	234,052 €
Equipment	46,296 €	69,444 €	92,592 €	115,740 €	138,888 €
Investments	2,963 €	3,168 €	- €	6,336 €	- €
Start-up	144 €	- €	- €	- €	- €
Marketing	540 €	544 €	548 €	553 €	559 €
Structural	4,379 €	4,506 €	4,668 €	4,972 €	5,347 €
Net	13,450 €	36,517 €	57,179 €	68,344 €	89,259 €
Payable	67,772 €	114,179 €	154,986 €	195,945 €	234,052 €
Compensate	54,322 €	77,662 €	97,808 €	127,601 €	144,793 €

Table 14.35: VAT calculations for scenario 2

14.10 VAT Management

As a key factor in the cash flow management of the company, VAT has to be carefully considered. Tables 14.34, 14.35 and 14.36 on page 269 stud, for each one of the three scenarios and year by year, the VAT to be paid to the government. It has been broken down in VAT on sales (income) and VAT on equipment, investments, start-up expenses, marketing and structural (otuflows). The difference between both represent the amount to pay to the government. In our case, there is no negative VAT in any scenario, so, compensation is not applicable. We have considered that by the end of the year, 3/4 of the total annual VAT has been paid, and only 1/4 remains as VAT payable for the next year.

	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Sales	67,772 €	152,250 €	197,297 €	259,882 €	353,527 €
Equipment	46,296 €	92,592 €	115,740 €	138,888 €	185,184 €
Investments	2,963 €	3,168 €	- €	6,336 €	- €
Start-up	144 €	- €	- €	- €	- €
Marketing	540 €	544 €	548 €	553 €	559 €
Structural	4,379 €	4,819 €	5,121 €	6,322 €	6,772 €
Net	13,450 €	51,127 €	75,887 €	107,783 €	161,012 €
Payable	67,772 €	152,250 €	197,297 €	259,882 €	353,527 €
Compensate	54,322 €	101,123 €	121,409 €	152,099 €	192,515 €

Table 14.36: VAT calculations for scenario 3

14.11 Cash Flow Forecast

Tables 14.37, 14.38 and 14.39 show the Cash Flow forecast for the first five years of operation in the pessimistic, probable and optimistic scenarios respectively. These tables include cash inflows as well as cash outflows, in a yearly basis. Net cash movement is the difference between inflows and outflows, and Cash Balance represents the theoretical cash position of the company by the end of each year. In these calculations, we have considered that all invoices emitted or received within one fiscal year are paid in that year. In each one of the scenarios except in the first scenario and considering the case of a long-term borrowing of 100.000€, cash balance is always positive , and this allows the company to maintain a certain cash position that permits avoiding unnecesary risks.

In order to operate completely safe, we have studied the cash flow during the first two years of operation in a monthly basis, for all the three scenarios. These studies are shown in appendix of this Business Plan. This study reflects a more accurate reality, as it considers a Payment Period of 90 days as well as a Collection Period of 90 days too. Also, contracts are signed in a month that has been determined randomly, except for the first contract, that is subject to product development. This permits us to see a more realistic cash flow for the first two years. Again, considering a 100.000€ long term borrowing, we obtain in the three scenarios a positive cash position month by month, ensuring a right operation regarding cash.

	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Total cash inflows	**421,928 €**	**217,091 €**	**439,633 €**	**667,192 €**	**903,894 €**
FIN Common stocks	100,000 €	- €	- €	- €	
FIN Borrowings	100,000 €	- €	- €	- €	- €
FIN Financial income collections	- €	- €	- €	- €	86 €
FIN Financial investment recovery	- €	- €	- €	- €	10,000 €
OP Sales collections	188,075 €	183,975 €	372,570 €	565,417 €	757,464 €
OP Exploitation subsidy collection	- €	- €	- €	- €	- €
OP VAT from Hacienda	- €	- €	- €	- €	- €
OP VAT from sales	33,853 €	33,116 €	67,063 €	101,775 €	136,343 €
Total cash outflows	**349,356 €**	**309,975 €**	**452,790 €**	**705,315 €**	**832,106 €**
FIN Dividends payments	- €	- €	- €	- €	- €
FIN Borrowings	- €	23,161 €	24,346 €	25,592 €	26,901 €
FIN Financial expenses payments	5,000 €	4,474 €	3,289 €	2,043 €	743 €
FIN Financial investment	- €	- €	- €	10,000 €	10,000 €
OP Capex	16,460 €	17,600 €	- €	35,200 €	- €
OP Payments to suppliers	128,600 €	128,600 €	257,200 €	385,800 €	514,400 €
OP Payments to employees	138,610 €	76,528 €	77,293 €	117,797 €	118,975 €
OP Startup expenses	800 €	- €	- €	- €	- €
OP Structural expenses	23,730 €	23,294 €	24,012 €	25,284 €	26,044 €
OP Marketing expenses	3,000 €	3,021 €	3,045 €	3,073 €	3,103 €
OP VAT paid to Hacienda	2,090 €	2,244 €	12,438 €	19,642 €	34,101 €
OP VAT paid on purchases	31,066 €	31,053 €	51,166 €	80,884 €	97,839 €
OP Income taxes paid	- €	- €	- €	- €	- €
Net of cash movements	**72,572 €**	**- 92,884 €**	**- 13,157 €**	**- 38,122 €**	**71,787 €**
Cash balance	**72,572 €**	**-20,312 €**	**- 33,469 €**	**- 71,591 €**	**196 €**

Table 14.37: Cash Flow for scenario 1

	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Total cash inflows	**644,283 €**	**748,508 €**	**1,016,022 €**	**1,294,617 €**	**1,544,428 €**
FIN Common stocks	100,000 €	- €	- €	- €	- €
FIN Borrowings	100,000 €	- €	- €	- €	- €
FIN Financial income collections	- €	- €	- €	86 €	86 €
FIN Financial investment recovery	- €	- €	- €	10,000 €	10,000 €
OP Sales collections	376,511 €	634,328 €	861,036 €	1,088,585 €	1,300,289 €
OP Exploitation subsidy collection	- €	- €	- €	- €	- €
OP VAT from Hacienda	- €	- €	- €	- €	- €
OP VAT from sales	67,772 €	114,179 €	154,986 €	195,945 €	234,052 €
Total cash outflows	**509,809 €**	**768,389 €**	**954,678 €**	**1,218,245 €**	**1,492,456 €**
FIN Dividends payments	- €	- €	- €	5,628 €	41,276 €
FIN Borrowings	- €	23,161 €	24,346 €	25,592 €	26,901 €
FIN Financial expenses payments	5,000 €	4,474 €	3,289 €	2,043 €	743 €
FIN Financial investment	- €	- €	10,000 €	10,000 €	10,000 €
OP Capex	16,460 €	17,600 €	- €	35,200 €	- €
OP Payments to suppliers	257,200 €	385,800 €	514,400 €	643,000 €	771,600 €
OP Payments to employees	138,610 €	200,887 €	223,845 €	266,677 €	341,708 €
OP Startup expenses	800 €				
OP Structural expenses	24,330 €	25,034 €	25,932 €	27,624 €	29,704 €
OP Marketing expenses	3,000 €	3,021 €	3,045 €	3,073 €	3,103 €
OP VAT paid to Hacienda	10,087 €	30,750 €	52,013 €	65,553 €	84,030 €
OP VAT paid on purchases	54,322 €	77,662 €	97,808 €	127,601 €	144,793 €
OP Income taxes paid	- €	- €	- €	6,254 €	38,596 €
Net of cash movements	**134,473 €**	**- 19,881 €**	**61,344 €**	**76,372 €**	**51,972 €**
Cash balance	**134,473 €**	**114,592 €**	**175,936 €**	**252,308 €**	**304,280 €**

Table 14.38: Cash Flow for scenario 2

	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5
Total cash inflows	**644,283 €**	**1,008,169 €**	**1,303,477 €**	**1,713,759 €**	**2,327,652 €**
FIN Common stocks	100,000 €	- €	- €	- €	- €
FIN Borrowings	100,000 €	- €	- €	- €	- €
FIN Financial income collections	- €	86 €	86 €	86 €	86 €
FIN Financial investment recovery	- €	10,000 €	10,000 €	10,000 €	10,000 €
OP Sales collections	376,511 €	845,833 €	1,096,094 €	1,443,790 €	1,964,039 €
OP Exploitation subsidy collection	- €	- €	- €	- €	- €
OP VAT from Hacienda	- €	- €	- €	- €	- €
OP VAT from sales	67,772 €	152,250 €	197,297 €	259,882 €	353,527 €
Total Cash outflows	**519,809 €**	**995,663 €**	**1,215,052 €**	**1,575,692 €**	**2,100,889 €**
FIN Dividends payments	- €	- €	- €	20,942 €	89,794 €
FIN Borrowings	- €	23,161 €	24,346 €	25,592 €	26,901 €
FIN Financial expenses payments	5,000 €	4,474 €	3,289 €	2,043 €	743 €
FIN Financial investment	10,000 €	10,000 €	10,000 €	10,000 €	10,000 €
OP Capex	16,460 €	17,600 €	- €	35,200 €	- €
OP Payments to suppliers	257,200 €	514,400 €	643,000 €	771,600 €	1,028,800 €
OP Payments to employees	138,610 €	253,402 €	311,813 €	402,759 €	500,201 €
OP Startup expenses	800 €	- €	- €	- €	- €
OP Structural expenses	24,330 €	26,774 €	28,452 €	35,124 €	37,624 €
OP Marketing expenses	3,000 €	3,021 €	3,045 €	3,073 €	3,103 €
OP VAT paid to Hacienda	10,087 €	41,708 €	69,697 €	99,809 €	147,705 €
OP VAT paid on purchases	54,322 €	101,123 €	121,409 €	152,099 €	192,515 €
OP Income taxes paid	- €	- €	- €	17,452 €	63,503 €
Net of cash movements	**124,473 €**	**12,506 €**	**88,425 €**	**138,066 €**	**226,763 €**
Cash balance	**124,473 €**	**136,980 €**	**225,404 €**	**363,471 €**	**590,234 €**

Table 14.39: Cash Flow for scenario 3

Initial Investment:	- 200,000 €
FCF Y1:	- 49,410 €
FCF Y2:	1,047 €
FCF Y3:	74,021 €
FCF Y4:	74,502 €
FCF Y5:	111,725 €
FCF Y6:	150,792 €
NPV:	36,789 €
IRR:	11.6%
Discount Rate (WACC):	8%
Company Residual or perpetual value:	312.887 €
Real Value of a Company:	349,676 €

Table 14.40: FCF for the probable scenario. Company Residual value is considering a discount rate of 14%, increasing 1% year by year during 10 years of operation.

14.12 Business Profitability

This section studies how profitable is AIRFID S.L.With this purpose, we have employed the NPV (Net Present Value) and IRR (Internal Rate of Return) ratios.

To calculate NPV we have previously calculated the Free Cash Flow (FCF) for a period of six years. This period has been chosen because the last investment is made during the fourth year with an amortization period of 3 years. Hence, 6 years is a more realistic approach to measure this ratio. FCF is calculated, for every year, taking the company result (Earnings after taxes) eliminating financial results (in our case is only financial cost), and adding amortization and substracting investments (CAPEX). In our case, extra operating funds are not needed, as we don't have neither inventories, nor accounts receivables, nor accounts payables. Taking into account these premises, Table 14.40 shows FCF for the probable scenario. The table includes in the first column the initial investment of 200.000€.

Considering a discount rate of 4% (estimated profitability of the best investing alternative for the period considered) a positive NPV of 90.337€is obtained, which means that the company creates value for its shareholders.

In addtion, in that scenario AIRFID S.L. obtains an IRR of 11.6%, much higher that the company cost of capital, estimated around 8%, according to the relative weight of equity against debt and its higher cost.

Figure 14.4 on page 275 shows a sensitivity analysis for NPV in the probable scenario, against discount rates, demonstrating the key importance of reducing the cost of capital, which would create an important increase in the company NPV.

As a conclusion, we can firmly state that AIRFID S.L. is a very interesting option for any investor, as it yields a positive NPV and high IRR.

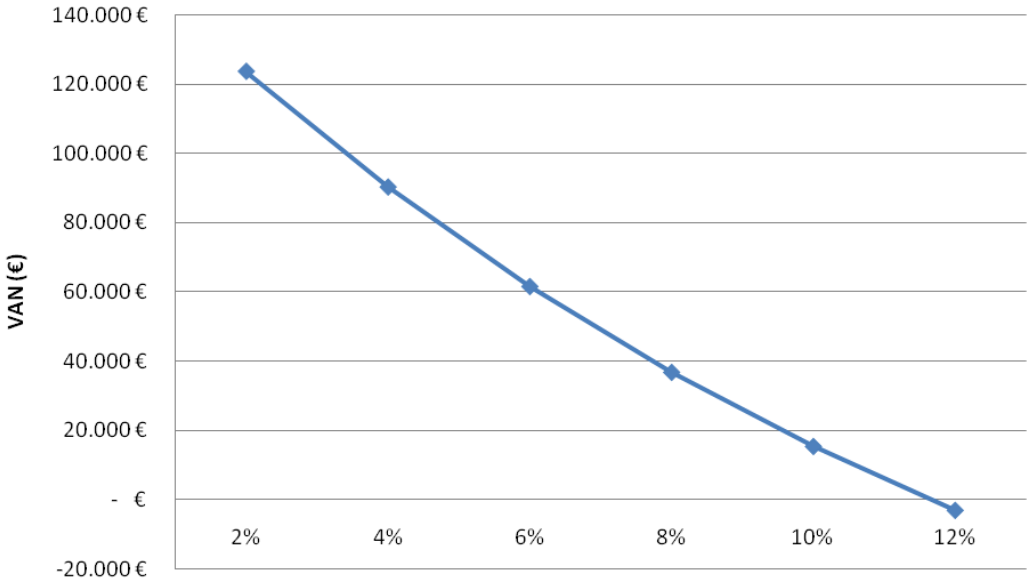

Figure 14.4: TIR vs Discount rate

14.13 Ratios Analysis

This section describes the ratios that permit monitoring the performance of the company. Table 14.41 shows the most relevant of them, calculated with data from probable scenario. The following comments are referred to the fifth year of that scenario, as the most representative of a stabilized company.

- ROE: AIRFID S.L. presents a ROE of 38%, being a great value for shareholders.
- ROS: last three years of the forecast show a Return On Sales around 8%, above sector average 4%.
- ROA of 39% show an efficient use of assets.
- Financial Leverage of the company is very low, presenting a value of 0% reached after important decreases since the first year.
- EPS by the end of the fifth year has a value of 99,25€.
- Payout ratio is 42%.
- Payback after ther year 3.
- Working Capital as a percentage of Sales, is 19% against an average of 13% in the sector, what provides AIRFID S.L. with an interesting position regarding liquidity.

	2010	2011	2012	2013	2014
ROE	-77%	5%	50%	44%	38%
ROS	-12%	0%	7%	8%	8%
ROA	-30%	5%	38%	41%	39%
ROCE	-34%	6%	48%	57%	55%
Current Ratio	9.59	5.17	4.68	3.36	3.47
Debt Ratio	57.63%	46.63%	24.27%	8.47%	0.00%
Debt to Equity	1.77	1.29	0.44	0.13	0.00
EPS	-43.44	2.82	59.38	90.06	99.25
Payout ratio	0.00%	0.00%	0.00%	6.25%	41.59%
Treasury	237.74%	192.97%	148.14%	124.17%	116.51%
WC	145,59 €	119 €	165,39 €	206,63 €	249,43 €

Table 14.41: Ratios in the most probable scenario

14.14 Equity, liabilities and subsidies

This section explains AIRFID's funding strategy, i.e. which proportions of equity and liabilities are used and how this money will be obtained. The chapter also brings out the amounts of equity and liabilities that are presented in the balance sheet. In the last part of the chapter, an overview is given among the different subsidies available for an entrepreneurial and for EBTs (Empresa de Base Tecnológica).

14.14.1 Equity

Each partner contributes with 20.000 €.Considering that there are 5 partners, it means an initial equity of 100.000 €. It will be deposited when the company is settled down. After the initial capital, AIRFID S.L will study new sources of stock capital for the future.

14.14.2 Liabilities

In our financial forecast, we have considered a long-term loan through ENISA Empresa Nacional de Innovación S.A. , which is a private company that is financed by the Ministry of Industry, Tourism and Trade through the General Directorate of Policy for SMEs [42].

ENISA was established in 1982 and since then it has been developing its activity in the field of financial investments, mainly in projects in the stages of birth and growth for new and technological companies.

ENISA's activity is to support and promote the SME, offering them a participative loan, a hybrid of equity and debt that is accounted as equity for purposes of compulsory dissolution rules or reduction of share capital. Participative loans may not be amortized unless the equity of the project company is increased in an equal amount. This kind of loan is an instrument that provides long-term resources to companies. The interest rate is linked

to the result of the company without any assurance, just by approving the business case projects and professional expertise of the management team.

ENISA has different financing lines as it can be seen in the following tables. These lines are almost equal but have some differences that are shown in the Table 14.42 on page 279.

General Financial Conditions

Interest rates are linked to the results of the company, with a minimum of Euribor +0,5% and a maximum that depends on the profitability of the company and that is always less than 6 percentage points above the minimum interest rate.

Conditions for access to finance

The basic criteria for the selection of projects are:

- Being SME, as defined by the recommendation of the Commission of the European Union on 6 August 2008.
- Being framed in any industry except real estate and finance. The selected sector needs to have significant growth perspectives.
- Quality and viability of the business project, which must be adequate to the exposed risk.
- Professionalism of management: business experience in the industry, technical training and coverage of all management areas of the company.
- Having financial statements audited and / or deposited in the accounts register. It is not applied for new companies.
- The product or services need to have competitive advantages over the existing products.

Procedure

The companies interested in a loan from ENISA must follow one of the following steps:

- Complete and send the Application Form of ENISA.
- Apply for this loan through high risk capital companies that have collaborative agreements with ENISA.

	New companies	Innovative companies	Special programs
Beneficiaries	Young entrepenurs	EBT/ Bussines Aangels/ High Risk	Aeronautical sector
Type of loan	Loan	Participative loan	Participative loan
Maximun loan capital	50,000 €	100,000€ - 1,5M€	100,000€ - 1,5M€
Financial guarantee	Without	Without	Without
Interest	EURIBOR+1,5%	EURIBOR+0,5%	EURIBOR+(0,5%–0,75%)
Commitment fee	0%	0.50%	0.50%
Early amortization	0.50%	2.00%	2.00%
Grace period	6 months	5 years	7 years
Amortization period	5 years	7 years	9 years
Amount of the line	25 M€	30 M€	30 M€

Table 14.42: Types of loans of ENISA.

ENISA in Figures

ENISA has thus far provided a total of 588 equity loans, amounting to 197.51 million €. It is shown in the Figure 14.5.

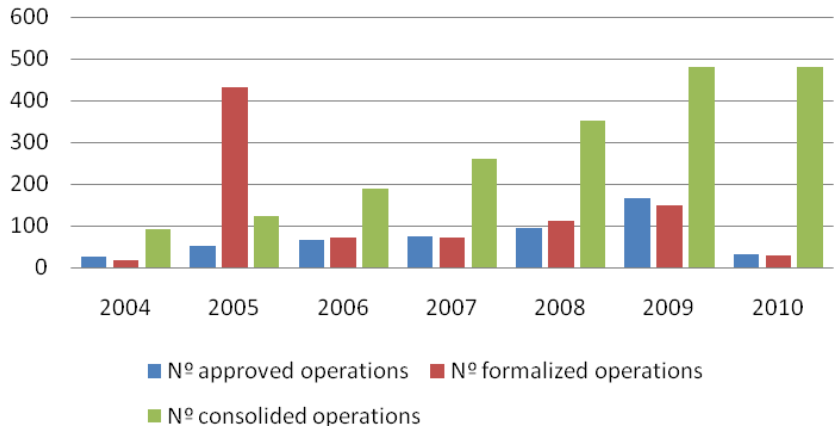

Figure 14.5: Number of loans of ENISA

The required loan will be of 100.000 €, with a amortization period of 5 years. The calculations are based on an interest rate of 5%, because it will be the worst case possible. The current value of Euribor is 1.214 % (22/03/2010). The amortization of the principal will start in year 2, and the financial numbers are shown in the Table 14.43. The loan must be obtained before the purchase of the equipment, which is made in month 3, as it is described in the cash flow analysis. The amount of the debt has been fixed in order to cover the maximum negative cash flow in the negative scenario and to have at least 50.000 €in the most possible scenario.

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Payback	- €	23,161 €	24,346 €	25,592 €	26,901 €
Financial cost	5,000 €	4,474 €	3,289 €	2,043 €	743 €

Table 14.43: Interest of the loan

Other possibilities given by private banks and the public sector will be used in case of necessity:

Option A - Line of credit: This option will be interesting. The company can use the money to buy the equipment for the implantation in the customers facilities. It means that AIRFID S.L will need this money to pay in advance the equipment purchase. Nowadays, it is not so difficult to obtain a line of credit so after the first projects AIRFID will use this financial product frequently. The common interest consulted in several banks is around 4,5%. The payment of the interests will be made quarterly and these interests are only applied to the money used from the credit line.

Option B - Long term credit through ICO: A long-term credit of 100.000€may be obtained through ICO (Instituto de Crdito Oficial). As the company is considered a SME according to the ICO standards, the credit is given with an interest of Euribor+ 0,85 % for a period of 5 years, with a 1 year of grace period. The equipment bought and the capital of the company will be used as endorsement. If such assets were not enough the partners would add some personal possessions to get the credit.

14.14.3 Subsidies

Our company will not depend on subsidies to operate and survive. There are however, powerful arguments to objectively foresee that AIRFID S.L will get large support from the general/regional governmental organizations:

1. It is a technologically and innovative challenging project, pioneer on the national aeronautic sector. Innovation is always supported by numerous administrations. (EBT) administrations described before like IDEA,ICO or ENISA.
2. The setup of our company will be a small sized company (SME), which gets support from governments that try to promote competitiveness in their region.
3. AIRFID is based on technology and innovation, concepts that are gaining weight every day in Europe developing the interest and inspiring initiatives to aid projects like this.

The supporting organizations are very numerous, and vary from regional to state. This section will describe a list of examples of different subsidies that AIRFID S.L can apply to. There is the need to point out though, that the mention of these subsidies does not automatically imply their awarding, nor implies that the deductions can be applied to the whole of the industrial activity of the company.

- IDEA Agency.
- JEREMIE Funds.

IDEA Agency

The *Agencia de Innovación y Desarrollo de Andalucía* IDEA (the Agency for Innovation and Development of Andalusia) has been appointed by the Regional Ministry of Innovation, Science and Enterprise as the instrumental executor for the policies of promotion of economic and social development. In order to ensure the fulfilment of this central objective, the Agency has put

Figure 14.6: IDEA Agency

together the 2005-2008 Strategic Plan in which it defines its mission and its methods to achieve it.

The mission of IDEA is to contribute to the economic and social development of the region, offering the best services to Andalucian companies, employers and the Junta de Andalucía (Autonomous Government of Andalucia) itself, promoting the spirit of business, innovation and cooperation within the science-technology-business system and the competitiveness of the production structure.

Objectives and Performance Principles:

- The implementation of new methods and models of governance.
- Support for Innovation and Territorial Intelligence.
- Promotion of public-private partnerships.
- Development of the spirit of enterprise and innovation.
- The design and implementation of quality support services.
- Provision of capital resources for the support and finance of businesses.
- The establishment of an appropriate administrative environment adapted for the creation of business.
- Promotion of cooperating networks between agents of the Innovation-Science-Enterprise system.
- Incorporation of cultural and environmental criteria that improve the quality of life.
- The support of benchmarking.

IDEA provides Andalusian entrepreneurs and small innovative businesses business nursery and development by means of the European Business Innovation Centres (BIC), which means that they can rent space for business activities and they can receive tutoring on innovative business projects.

JEREMIE Fund

The Joint European Resources for Micro to Medium Enterprises initiative, known by the acronym JEREMIE, is an initiative of the European Commission's Directorate General for Regional Policy and the EIB Group (European Investment Fund and European Investment Bank) to enhance SME finance [43].

Figure 14.7: JEREMIE Fund logo

JEREMIE offers EU Member States, through their national and regional Managing Authorities, the opportunity to use part of their EU Structural Fund allocation to indirectly finance SMEs,through financial intermediaries, by means of equity, loans or guarantees, through revolving Holding Funds. In accordance with the structural funds regulations, these Holding Funds can be managed either by the EIF or national institutions.

The main benefits of JEREMIE are:

- **Flexibility:** Contributions from the Operational Programmes to the JEREMIE Holding Fund will be eligible for interim up-front payments by EU Structural Funds, giving Managing Authorities more flexibility in allocating these resources. Structural Fund contributions to the Holding Funds must be invested in SMEs by 2015.
- **Benefits of a portfolio approach:** The Holding Fund will be able to re allocate the resources to one or more financial products in a flexible way, depending on the actual demand over time. The umbrella fund approach will allow a diversification of risks and expected returns due to financial products having different default rates, as well as active cash flow management to allow for a swift response to changing market requirements.
- **Recycling of funds:** The Holding Fund is of a revolving nature, receiving repayments from the financial intermediaries for further investments in the SME sector. This makes SME support via EU Structural Funds sustainable, unlike the pure grant approach.
- **Leverage:** A significant implied advantage of JEREMIE is its potential ability to engage the financial sector either at the Holding Fund level, with additional capital from financial institutions, or at the level of financial instruments, through co financing, e.g. in both cases potentially in cooperation with the EIB.

Procedure

The figure 14.8 shows the procedure for every JEREMIE application.

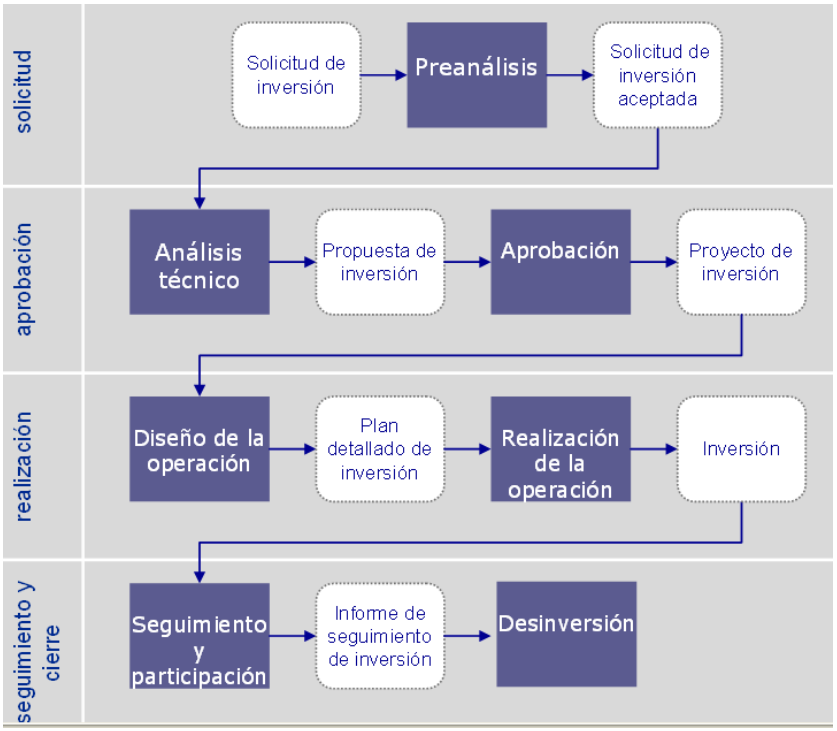

Figure 14.8: JEREMIE Procedure

EIF's expertise as a Holding Fund manager can be of particular added value in the lesser developed regions like Andalusia where there is a need for capacity building initiatives and transfer of know how between local institutions and EIF. In those regions where JEREMIE is managed by IDAE agency.

The JEREMIE Holding Funds, managed by EIF, will provide a wide range of financial instruments for SMEs, such as microcredit, guarantees, venture capital and equity type instruments, or export credit insurance.

Chapter 15

Information System

Information Systems (or IS) is historically defined as a bridge between the business world and computer science, but this discipline is slowly evolving towards a well-defined science. Typically, Information Systems (or IS) include procedures, data, software, and hardware (by degree) that are used to gather and analyze information. Specifically computer-based information systems are complementary networks of hardware/software that people and organizations use to collect, filter, process, create, and distribute data.

Today, Computer Information System(s) or CIS is often a minor track within the computer science field pursuing the study of computers and algorithmic processes, including their principles, their software & hardware designs, their applications, and their impact on society. Overall, an IS discipline emphasizes functionality over design.

In a broad sense, the term Information Systems refers to the interaction between algorithmic processes and technology. This interaction can occur within or across organizational boundaries. An information system is not only the technology an organization uses, but also the way in which the organizations interact with the technology and the way in which the technology works with the organization's business processes. Information systems are distinct from Information Technology (IT) in that an information system has an Information Technology component that interacts with the processes components.

Information Technology can help all kinds of businesses improve the efficiency and effectiveness of their business processes, managerial decision making, and workgroup collaboration, thus strengthening their competitive positions in a rapidly changing marketplace. Furthermore, Information Technologies are playing an expanding role in business nowadays.

Internet-based systems have become a necessary ingredient for business success in todays dynamic global environment. And our idea is to use this new technology to approach customers. That's why we intend to install a website on internet where the customer can see our product. We want our

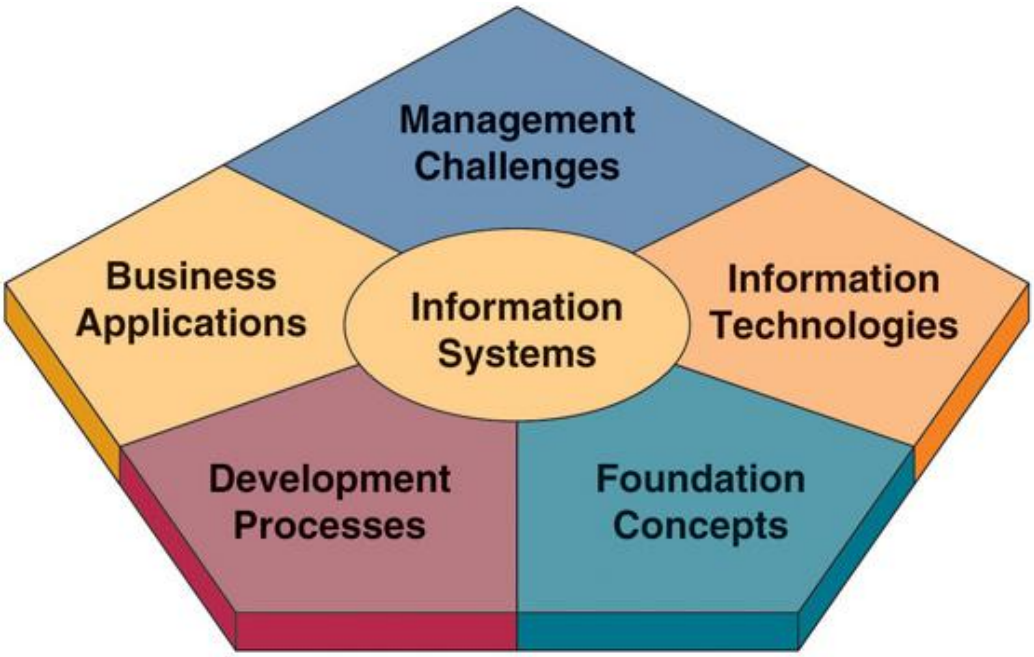

Figure 15.1: Information Systems Model

future customer to trust us, so the best idea is explaing him how we work.

15.1 Purpose of AIRFID website

In this section we will explain the purpose of developing an information system in our company. The main goals of this project are

- Portfolio of our products
- Give the customer an approach to contact us
- Offer him confidence about our quality
- Provide information about the benefits of RFID
- Expose previous success stories

By installing this website we will be able to minimize costs, time, and use of information resources.

15.2 Technology used in the website

The website will be designed and developed by one the shareholders of the company by using Linux, Apache, MySQL and PHP technology (LAMP).

This software combination has become popular because it is free of cost, open-source, and therefore easily adaptable, and because of the ubiquity of its components which are bundled with most current Linux distributions. When used in combination they represent a solution stack of technologies that supports application servers. As all these tools are free, we will not need to invest money in this operation.

15.2.1 Linux

Linux is a generic term referring to Unix-like computer operating systems based on the Linux kernel. Their development is one of the most prominent examples of free and open source software collaboration; typically all the underlying source code can be used, freely modified, and redistributed, both commercially and non-commercially, by anyone under licenses such as the GNU General Public License (GPL).

Figure 15.2: Linux

Linux can be installed on a wide variety of computer hardware, ranging from embedded devices such as mobile phones and wristwatches to mainframes and supercomputers.Linux is predominantly known for its use in servers; in 2007 Linux's overall share of the server market was estimated at 12.7%, while a 2008 estimate suggested that 60% of all web servers ran Linux. Most desktop computers run either Mac OS X or Microsoft Windows, with Linux having only 12% of the desktop market. However, desktop use of Linux has become increasingly popular in recent years, partly owing to the popular Ubuntu distribution and the emergence of netbooks.

Typically Linux is packaged in a format known as a Linux distribution for desktop and server use. Linux distributions include the Linux kernel and all of the supporting software required to run a complete system, such as utilities and libraries, the X Window System, the GNOME and KDE desktop environments, and the Apache HTTP Server. Commonly-used applications

with desktop Linux systems include the Mozilla Firefox web-browser and the OpenOffice.org office application suite.

15.2.2 Apache

The Apache HTTP Server,commonly referred to as Apache, is web server software notable for playing a key role in the initial growth of the World Wide Web. In 2009 it became the first web server software to surpass the 100 million web site milestone. Apache was the first viable alternative to the Netscape Communications Corporation web server (currently known as Sun Java System Web Server), and has since evolved to rival other Unix-based web servers in terms of functionality and performance. The majority of web servers using Apache run a Linux operating system.

Figure 15.3: Apache Server

Apache is developed and maintained by an open community of developers under the auspices of the Apache Software Foundation. The application is available for a wide variety of operating systems, including Unix, GNU, FreeBSD, Linux, Solaris, Novell NetWare, Mac OS X, Microsoft Windows, OS/2, TPF, and eComStation. Released under the Apache License, Apache is characterized as open source software.

Since April 1996 Apache has been the most popular HTTP server software in use. As of September 2009 Apache served over 54.48% of all websites and over 66% of the busiest.

15.2.3 MySQL

MySQL is a Relational Database Management System (RDBMS) that runs as a server providing multi-user access to a number of databases.

The MySQL development project has made its source code available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements. MySQL is owned and sponsored by a single for-profit firm, the Swedish company MySQL AB, now owned by Sun Microsystems, a subsidiary of Oracle Corporation.

In response to the acquisition by Oracle, members of the MySQL community have created several forks such as Drizzle and MariaDB in fear that Oracle would hurt the development of MySQL because MySQL competes with from the Oracle Corporation's other database products.

Figure 15.4: MySQL

Free-software projects that require a full-featured database management system often use MySQL. Such projects include (for example) WordPress, phpBB and other software built on the LAMP software stack. MySQL is also used in many high-profile, large-scale World Wide Web products including Wikipedia, Google, Drupal and Facebook.

15.2.4 PHP

Hypertext Preprocessor (PHP) is a widely used, general-purpose scripting language that was originally designed for web development to produce dynamic web pages. For this purpose, PHP code is embedded into the HTML source document and interpreted by a web server with a PHP processor module, which generates the web page document. As a general-purpose programming language, PHP code is processed by an interpreter application in command-line mode performing desired operating system operations and producing program output on its standard output channel. It may also function as a graphical application. PHP is available as a processor for most modern web servers and as standalone interpreter on most operating systems and computing platforms.

Figure 15.5: PHP logo

PHP was originally created by Rasmus Lerdorf in 1995 and has been in continuous development ever since. The main implementation of PHP is now produced by The PHP Group and serves as the *de facto* standard for PHP as there is no formal specification. PHP is free software released under the PHP License, which is incompatible with the GNU General Public License (GPL) because restrictions exist regarding the use of the term PHP.

15.3 Characteristics of the website

In this section we will briefly explain the different features of the website. In order to get all the requirements we will design some Use Case Diagram for the different customer options. These diagrams show the functionality provided by a system in terms of actors, their goals represented as use cases, and any dependencies among those use cases. All these diagrams will be made by ArgoUML, a Java based Universal Modeling Language tool capable of creating and saving all standard UML diagrams.

15.3.1 Frontpage

As this is the first page our customer visits, we need to explain our product and our services in a very brief way. We must gain the customer attention so he will be interested in getting more information abour RFID. In order to get this, we must take into account the website usability.

From the user's perspective usability is important because it can make the difference between performing a task accurately and completely or not, and enjoying the process or being frustrated. From the developer's perspective usability is important because it can mean the difference between the success or failure of a system. From a management point of view, software with poor usability can reduce the productivity of the workforce to a level of performance worse than without the system. In all cases, lack of usability can cost time and effort, and can greatly determine the success or failure of a system.

15.3.2 Services

In this section we will describe all the possible solutions our company can provide. We must show our customer the benefits of applying RFID in his company and how it will be turned in cost and time saving.

15.3.3 Sucess stories

If we are interested in gaining customer's trust, we must show him some success stories. In this section, we will display some companies we have worked with.

15.3.4 Contact

It is important to provide some contact information about our company whether by email or phone.

15.4 Internal Wiki for documentation

We will use in our company a Wiki server for internal knowledge management. Wiki software (also known as a wiki engine or wiki application) is software that runs a wiki, or a website, that allows users to collaboratively create and edit web pages using a web browser. A wiki system is usually a web application that runs on one or more web servers. The content, including all current and previous revisions, is usually stored in either a file system or a database. Wiki software is a type of collaborative software.

It is hard to determine which wiki applications are the most popular, although a list of lead candidates includes Foswiki, MoinMoin, TikiWiki, XWiki, DokuWiki, and MediaWiki (Google Insight for Search (history, trend, geographical statistics)). TWiki, Traction TeamPage and Atlassian Confluence are popular on intranets.

Figure 15.6: MediaWiki

We have chosen MediaWiki as our wiki applicataion. This software is a web-based wiki software application used by all projects of the Wikimedia Foundation, and many other wikis. Originally developed to serve the needs of the free content Wikipedia encyclopedia, today it has also been deployed by companies for internal knowledge management, and as a content management system. Notably, Novell uses it to operate several of its high-traffic websites. As MediaWiki is written in the PHP programming language, and can use either the MySQL or PostgreSQL, we will be able to install it in our server.

Chapter 16

Quality Management

16.1 Introduction

Quality is a perceptual, conditional and somewhat subjective attribute and may be understood differently by different people. While consumers may focus on the specification quality of a product/service, or how it compares to competitors in the marketplace, producers might measure the conformance quality, or degree to which the product/service was produced correctly.

In business, engineering and manufacturing the quality of a product or service refers to the perception of the degree to which the product or service meets the customer's expectations.

Many different techniques and concepts have evolved to improve product or service quality. There are two common quality-related functions within a business: One is quality assurance which is the prevention of defects, such as by the deployment of a quality management system and preventative activities. The other is quality control which is the detection of defects, most commonly associated with testing. That takes place within a quality management system typically referred to as verification and validation.

In order for our company to be recognized as a reliable and secure company in the eyes of our customers, it is advisable to adopt the standards under which most of the companies work: ISO certifications. They tell customers that our company has implemented a system to ensure that any product or service we sell will consistently meet international quality standards.

16.2 EN9100 Standard

At this point we need to determine what kind of standard would be advisable to adopt.

At first, since we are a service company that does not design or manufacture any part of an aircraft, we might think that we should adopt the ISO 9001 standard. However, there is a specific standard that includes all the ISO 9001 quality system requirements as well as additional requirements from the aerospace industry, known as the EN9100 standard [44].

Harmonization, standardization and globalization within the aerospace industry led to some of the main national manufacturers, suppliers and commercial associations in America, Asia and Europe coming together under the umbrella of the International Aerospace Quality Group (IAQG) with the aim of promoting initiatives to attain continual improvement in quality and a reduction in costs for the benefit of the industry all around the world.

The main result of this joint effort of the IAQG was the publication of the EN9100 standard (AS9100/JISQ9100 in the American/Japaness system respectively).

Specifically, the standard EN9100 emphasizes Control Design, Contract Review, Process Control, Purchasing, Inspection and Testing, Document Control, Control and Treatment of nonconformities, as those areas with greatest impact on safety and reliability of aerospace products.

Furthermore, certification against AS9100/EN9100/JISQ9100 requirements can be applied to almost any area of the industry and throughout the entire supply chain, including design and manufacture of equipment, aircraft accessory supply, airport and airline operations, replacement parts, supply and maintenance, overhaul and repair depots, flight operations and cargo handling.

In our case, as a start-up company that begins and makes its business within the Aerospace sector, we find strongly advisable to adopt this standard with the aim of working on the basis of specific quality requirements common to most of the companies in this sector and being seen as a secure company with which to do business.

16.3 Benefits of implementing a Quality System

It is important to remark that the Quality Management System standards created by ISO are meant to certify the processes and the systems of an organization, not the product or service itself.

The implementation of a Quality Management System will assist us by managing costs and risks, increasing effectiveness and productivity, identifying improvement opportunities and increasing customer satisfaction.

If the Quality Management System is well managed it can help us have an impact on customer loyalty and repeat business, market share, opera-

tional efficiencies, flexibility and ability to respond to market opportunities, effective and efficient uses of resources, cost reductions, competitive advantages, participation and motivation of human resources, industry reputation or control on all processes among many other benefits.

Furthermore, the fact of adopting the EN 9100 quality system certification will enable us to be registered in the OASIS international database (Online Aerospace Supplier Information System), and by doing so, our company will open its doors to the aerospace market on the full global scale, a fact that we should have in mind with the aim of expanding our company. We well have to take into account an annual cost of 400€corresponding to the registration fee in this database.

16.4 Implementation and Certification Process

The fact of obtaining the certification will help us run properly our company from its very beginning, providing us with a more robust system, more accountability and more employee involvement.

In our company the person responsible for implementing the Quality Management System will be the General Manager since he is supposed to have the deepest and widest knowledge of the daily running of the company. Nevertheless, the General Manager will be widely supported by the heads of Engineering and Operations in order to fulfill all the needed requirements. Among many other tasks he can be asked to:

- Write a quality manual to describe the quality system.
- Document how work gets done in the organization.
- Design and implement a system to prevent the recurrence of problems.
- Identify training needs of employees.
- Train employees about how the quality system works.
- Plan and perform quality inspections and internal audits.
- Comply with other requirements, as necessary.

The company in charge of certifying our Quality Management System under the requirements set by the EN9100 standard will be EQA (European Quality Assurance), one of the first companies accredited by ENAC (Entidad Nacional de Acreditación) to certificate under the EN9100 standard. EQA has certified more than 20% of the aeronautic companies in Spain and approximately the 46% of the companies of the aeronautical sector in Andalusia [45].

The key steps included in the certification process and its prices are described below:

- To define the scope of certification.
- Previous audit: analysis of compliance and diagnosis of the current situation in relation to the norm.
- Audit of certification: emission of the certificate (4.000€).
- Annual supervisory visits to monitor improvements during the first and second year after the emission of the certificate (2.000€per visit).
- Re-certification after 3 years through full audit or continuous assessment to ensure that the company continues to comply with the standard (4.000€).
- Immediate delivery of a comprehensive and thorough report after each phase, to follow our company constantly improving results in its quality management.

Any possible modifications of these prices should be taken into account in the expenses of the company. But, more than an extra cost, the EN9100 standard must be seeing as a cost of doing business, since from then on the benefits will overcome the costs.

A summarized outline of this process can be seen in Figure 16.1.

Figure 16.1: Certification process.

16.5 Expansion Plan

Although initially our business plan is focused on the application of RFID technology to control different elements such as parts, tools, jigs and instruments it is still worth considering for our future expansion plan that on the one hand Federal Aviation Administration (FAA) has approved the use of passive RFID devices on board the plane [46], and on the other hand the European Aviation Safety Agency (EASA) is studying the same possibility.

With regard to the installation of RFID devices in an aircraft, before applying for certification it is necessary to previously define the intended function of the installed RFID device (part marking, temperature logging, vibration monitoring, weight records or time-in-service computation for example) and evaluate the intended functions performed by the RFID devices, to determine any adverse effects from device installation and function.

But the case of installing passive RFID devices on approved aircraft parts, equipments, structure, engine, or propeller components is a minor design change that does not invalidate the existing airworthiness approval of the equipment/part.

For this reason and thanks to the approval of the use of passive RFID devices on board the plane by the FAA we find an advantage for our plans of expanding our business, beyond the control of certain elements.

And finally, as we expect to grow in the future we will study the possibility of being certified under new standards such as Occupational Health and Safety Assessment (OHSAS 18001) or implementing an Environmental Management System (EMS) according to ISO 14001 in order to bring excellence, sustainability and reliability to our company.

Chapter 17

Health and Safety Management

17.1 Introduction

The protection of workers from occupational accidents and diseases is primarily a management responsibility, on a par with other managerial tasks such as setting production targets, ensuring the quality of products or providing customer services.

Management sets the direction for the company. The strategic vision and mission statement establish a context for growth, profitability and production, as well as placing a value on workers´ safety and health throughout the enterprise.

For this reason, one of the foremost concerns for ARFID must be to provide a safe and healthy workplace and working environment for all its employees by promoting the highest standards of health, safety and welfare to ensure the prevention of injuries.

There are several reasons for establishing good occupational safety and health standards such as:

- **Moral:** An employee should not have to risk injury or death at work, nor should others associated with the work environment.
- **Legal:** Occupational safety and health requirements are reinforced in civil law and/or criminal law established by the Ministry of Labor and Immigration through the National Institute of Occupational Safety and Health at work, among others.
- **Economic:** Poor occupational safety and health performance result in a cost to the company, for instance through social security payments, costs for medical treatment or loss of the employability of the worker. The company should also have to sustain costs in the event of an incident at work, such as legal fees, fines, compensatory damages,

investigation time, lost production, lost goodwill from the workforce, from customers and from the wider community.

17.2 Implementation

The fact of being a small company does not exempt us from implementing a health and safety management system in order to prevent any possible risk, thus a Health and Safety Management System must be implemented.

Although the performance of an occupational safety and health system is an all employees´ responsibility, the Manager of the company will be ultimately responsible for ensuring the proper implementation of the system, holding frequent meetings with the heads of the different business areas of the company.

This plan should take into account the next aspects [47]:

17.2.1 Risk assessment

The risk assessment shall:

- Ensure that all hazards and risk are addressed.
- Address what actually happens in the workplace or during work activity.
- Ensure that all groups of employees and others who might be affected are considered.
- Identify groups of workers who might particularly be at risk.
- Take account of existing preventative or precautionary measures.
- Be carried out on a regular basis and the significant findings recorded.

17.2.2 Health and safety management

The company must put into place arrangements to manage health and safety issues by identifying priorities and setting objectives, and wherever possible, risks should be eliminated by the careful selection and design of facilities and equipment.

17.2.3 Health surveillance

The company shall ensure that all its employees are provided with health surveillance, as is appropriate, taking into consideration the risks identified through the assessment process.

17.2.4 Information for employees

The risk assessments will help to identify information which has to be provided to employees. Moreover, relevant information on risks and on preventive and protective measures will be limited to what employees and others need to know to ensure health and safety.

In addition, information should be provided on the emergency procedures, including the identification of staff nominated to assist in the event of an evacuation.

Furthermore, the company must establish procedures to be followed by any worker if situations presenting serious and imminent danger were to arise.

The procedures should provide clear guidance on when employees and others should stop working and move to a safe meeting point. The risk assessment should identify foreseeable events which need to be covered by these procedures which will be tested on a annual basis.

17.2.5 Training

Employees should be specifically trained for the task they perform, to ensure that those risks associated to the different jobs are properly controlled.

The risk assessment should help to identify the level of training needed for each type of work as part of the preventive and protective measure. This could include basic skills training, specific on-the-job training and training in health and safety or emergency procedures.

In the case of hiring new employees they shall receive basic training on Health and Safety, including arrangements of first aid, fire and evacuation.

17.2.6 Employees' duties

Finally, employees have a duty to take reasonable care for their own Health and Safety. Furthermore, the company should be made aware without delay of any work situation which might present a serious and imminent danger.

Employees should also notify the company of any shortcomings even when

no immediate danger exists, so that remedial action can be taken as may be needed.

17.3 Risk Assessment and Risk Rating Matrix

Different activities that are carried out by our employees could pose a hazard to them, such as for instance working with electronic equipments, working with display screen equipment, traveling to the facilities of our customers in order to negotiate or install our products or just the simple fact of working in the office itself, among many other activities.

In order to evaluate any possible risks a Risk Rating Matrix is used, as it is shown on Figure 17.1, by rating the risks as intolerable, important, moderate and tolerable in terms of severity of consequence and likelihood of occurrence.

In our case the guiding principles for risk scaling regarding severity of consequence are *slightly harmful* (1), *harmful* (2) and *extremely harmful* (3), while as regards likelihood of occurrence are *low* (1), *medium* (2) and *high* (3).

		Severity of Consequence		
		Slightly harmful	**Harmful**	**Extremely harmful**
Likelihood of ocurrence	**Low**	Negligible	Tolerable	Moderate
	Medium	Tolerable	Moderate	Significant
	High	Moderate	Significant	Intolerable

Figure 17.1: Risk Rating Matrix Definition.

To build a Matrix Rating Matrix it is needed to previously identify and evaluate the most important risks that our employees can face in terms of likelihood of occurrence and severity of consequence. A list of these risks can be seen on Table 17.1.

N	Risk	Prob.	Consequence
1	Blows / cuts with objects or tool	1	2
2	Exposure to electrical contacts	1	2
3	Caused by inadequate lighting or glare	1	1
4	Transportation accidents	1	3
5	Natural causes (heart attack, embolism..)	1	3
6	Due to non-ionizing radiation exposition	1	1
7	Eyestrain	2	1
8	Mental fatigue	2	1
9	Physical fatigue	1	1

Table 17.1: Risk Rating Matrix Model

According to the likelihood of occurrence and the severity of consequence of the risk listed on Table 17.1 we can have a previous estimation of the importance of the risk to which our employees are exposed, as the Risk Rating Matrix shows in Figure 17.2.

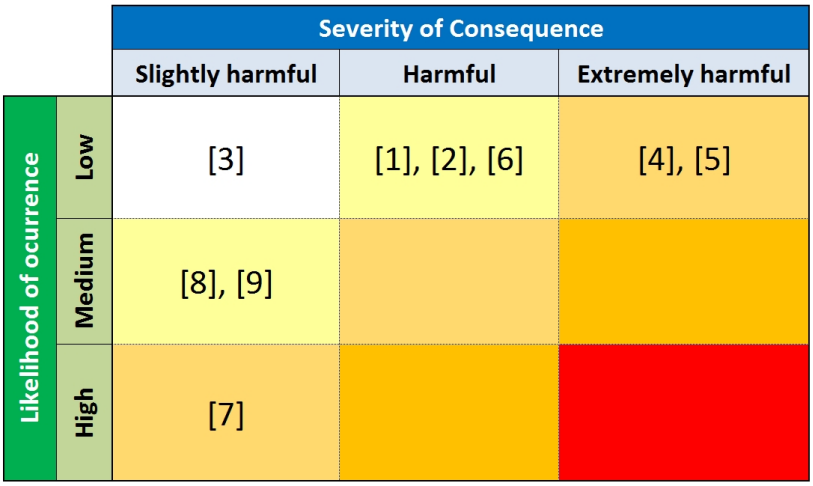

Figure 17.2: Risk Assessment: Risk Rating Matrix

Once risks have been identified and evaluated it is time to know the actions to take depending on the importance of the rank where they have been grouped. The actions to take would be as follow:

- In cases where the risk is negligible (3), no immediate action is required.
- In cases where risk is tolerable (1, 2, 6, 8 and 9), there is no need to improve the preventive action. Nevertheless these kind of risks require regular checks to ensure maintaining the effectiveness of control measures.
- In cases where risk is moderate (4, 5 and 7), efforts must be made to reduce the risk. Whenever possible measures to reduce this risk should be implemented in a given period of time. When the moderate risk is

associated with extremely harmful consequences a further action will be required to establish more precisely the chance of damage as a basis for determining the need for improved control measures. This is the case of diseases due to natural causes, where very few preventive actions can be carried out.

- Although seemingly there are no hazards which risk can be considered important it is convenient to know that when risks are rated as important work should not commence until it has reduced the risk. May be needed considerable resources to control risk. When the risk is related with a work that is being undertaken, a remedy for the problem should be taken in less time than for the moderate risk.

- Finally in the previous case there are no intolerable risk. In the case where such risks arise, work should not begin or continue until the risk has not been reduced. If the risk cannot be reduced even with unlimited resources, work should be prohibited.

After having considered the risks to which our employees can be addressed we can determine that the daily tasks in our company can be regarded as relatively safe. However, although risks assumed by our customers in their facilities are not included in this analysis, our employees should be warned about all kind of hazards they are exposed to in our customer´s facilities.

17.4 Legislation

At last, with the aim of assuring the Health and Safety of the employers, the employees and the workplace, some of the most important Spanish regulations regarding to Health and Safety Management that must be accomplished by our company are shown below [48]:

- Law 31/1995 on prevention of occupational risks.

- RD 486/97 which lays down minimum Health and Safety conditions in workplace.

- RD 488/97 concerning the minimum Health and Safety requirements to work with display screen equipment.

- RD 1215/97 which establishes minimum Health and Safety conditions for the use of work equipment by workers.

Chapter 18

Expansion Plan

This chapter draws the main lines of the future expansion of AIRFID S.L. As it has been explained in the Marketing Plan in chapter 13, this company will concentrate on the Andalusian Aeronautic sector in the fields of Manufacuring and Assembly. Regarding the main products offered, AIRFID will focus on the Asset, FIFO Parts and Export Licence Products tracking, as it is stated in the Operational Plan in Chapter 11. This is the selected policy for a new company entering a niche market such as the Aeronautic sector, but once the company gains maturity it will have different strategies to expand its business according to the experiences in the first years of operation and the changing market demands.

18.1 Geographical Expansion

As stated in the Marketing Plan, Andalusia is one of the most important regions of the Aeronautic sector and is the one that best suits the internal features of AIRFID S.L. However, there are more areas that must be taken into account when thinking about expanding the business, like Madrid, the Basque Country, Aragón and Catalonia. Once the Andalusian market is penetrated and there are a high amount of companies that make profit from the benefits of RFID technology, it will be normal that some competitors will appear, both in Andalusia and in the other regions. Therefore, making use of the acquired expertise in other Spanish regions would offer the company a great possibility of gaining market share and obtaining a significant increase in profits.

18.1.1 Madrid

Madrid is the most important region of Spain in terms of turnover in the aeronautic sector, with the 64% of the total income [49]. Therefore, it will be the first option to target when thinking about a geographical expansion.

Moreover, it is the closest aeronautic region from Andalusia and it is located in the centre of Spain, which allow us to be present in other regions by stablishing an office in Madrid. In case the company obtains a contract with Airbus Military, the possibility of opening a branch in Madrid will gain importance, as the factories of Barajas and Getafe could give AIRFID a lot of possibilities to expand its services in this region.

18.1.2 Basque Country, Aragón and Catalonia

These 3 regions have 17% of the total income of the Spanish aeronautic sector. Hence, they are not as interesting as Madrid or Andalusia as they are less concentrated and have lower amount of sales. However, once AIRFID reaches the Andalusian and Madrilenian markets, the next step would be to penetrate these regions in order to fully cover the Spanish market and the whole local Supply Chain. Moreover, the company would be able to make profit from several contacts in the Aeronautic sector, like Sener and the IK4 Alliance.

18.1.3 International Expansion

It will take some years until AIRFID takes seriously the possibility of expanding its business internationally. However, if AIRFID manages to succeed in Spain it will be natural to target another market. To start with, the company will look for Spanish companies that have factories abroad, as they will have more chances to succeed in a known company rather than in a foreign unknown company. For example, Alestis has important contracts in Brazil with Embraer, and Aernnova has several factories in Mexico, Brazil and the United States. Airbus Military has also got factories abroad, as in Poland with PZL and in the different conversion centres of the MRTT program. This would be a good way to enter the different European and American markets, as these experiences would be also attractive from the marketing point of view, both as promotion and as market research. The following figure shows the main European Aerospace regions where AIRFID could expand its activities.

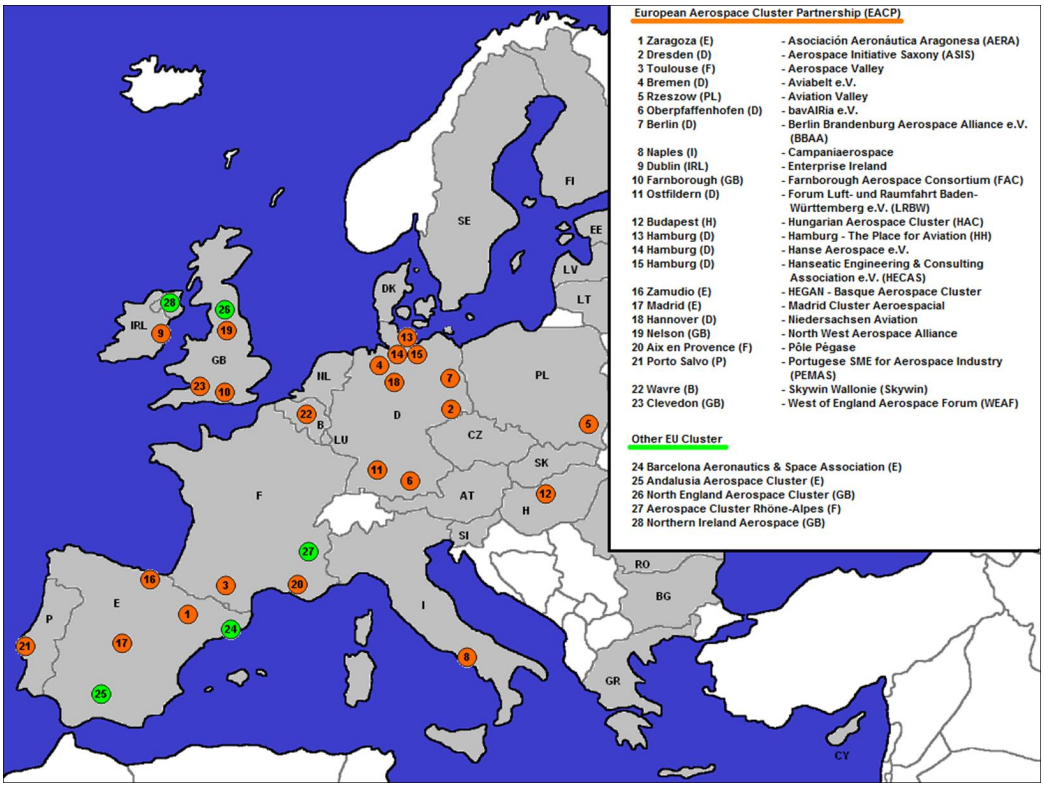

Figure 18.1: European Aerospace Cluster Partnership (EACP)

18.2 Service Expansion

The second expansion possibility is to offer different services that would add value to each of the customers of AIRFID. The market share doesn't increase but the amount of money increases significantly. This scenario is normally found in saturated market as the IT, where the operators are no longer trying to steal clients to the competitors but they make a stronger effort in developing services that make the added value rise, which impacts positively in the turnover. In the case of AIRFID, expanding through different services could be made in the hypothetical case of the market saturation or simply in the case of needs detection. Along this business case it has been explained that the main activity of AIRFID will be based on in-house tracking of assets in the different factories, but it is possible that two more services are added: Adding tags on board of the aircrafts and offering an integrated platform for the whole supply chain tracking.

18.2.1 On Board Tags

Using RFID tags in the different parts and equipments of the aircrafts is an idea that Boeing and Airbus are already taking seriously, but AIRFID will

carry on its benchmarking before including this service in its portfolio. As mentioned in Chapter 4, IATA has certified the use of tags on board, which opens a world of possibilities in terms of MRO (Maintenance, Repair and Overhaul). As a matter of fact, Airbus has already defined that the tags they plan to use must store all the maintenance information for at least 12 years, and they plan to tag between 2000 and 5000 parts of the new A350. Up to now, workers spend a big amount of time to check that all the equipment in an aircraft is the one that has been assigned, and there are often many errors that cause that an aircraft leaves the production site with equipment from another aircraft. By using RFID tags, all checking process will be done automatically and there would be no room for human error.

18.2.2 Supply Chain Tracking

RFID technology makes possible to track the different assets all along the Supply Chain, which would be revolutionary to optimize all the production process and to better control the different entities that take part in the production process. Once RFID tags are present in the different products since their first step, AIRFID plans to launch an integrated platform to cover all the supply chain and to offer information about any product requested by any company that has some relation with it. This would be interesting from the customer fidelization point of view as many of the clients will have contracted AIRFID, and also as another source of income from the customers that already have an RFID solution made by another company but that are willing to integrate their information in this platform.

Figure 18.2: Project of Fedex and Boeing for RFID tags on aircraft parts

18.3 Product Expansion

AIRFID has chosen to offer tracking services for assets using UHF passive tags, as it is the current trend of the market and currently fulfills the requirements of the main clients. However, there are some other products that complement or substitute the main functionalities of RFID UHF tags and may be requested by the clients. If the commercial department confirms this possibility, AIRFID will consider the possibility of offering a wider range of products to its clients. Currently, it can be foreseen that the products that are bound to enter the asset tracking market are the Active RFID tags, the CMBs (Contact Memory Buttons) and the GPS systems.

18.3.1 Active RFID Tags

There are already some pilot projects using Active RFID tags in the aeronautic sector, but there are still some limitations both from the technical and from the legal point of view. However, they offer some additional possibilities that UHF passive tags don't have, as a high accuracy for location systems, much longer range and the possibility to use sensors in the tags. Passive tags don't normally go further than 5 meters but with active tags it is possible to track an object that is 100 meters away from the reader. Their main drawback is the battery they need and their high level of emissions, but they are already developing the product in order to obtain the airworthiness certification from the IATA. It is considered that the usage of active tags on flights sets a stage to begin deploying wireless sensor networks, in which temperature sensors could be attached to the tags to monitor perishable goods in transit, for example. According to Boeing, active tags will improve the visibility of the conditions to which airplane parts are exposed during flight, as the gravity forces in the landing gear. As soon as they are successful, AIRFID will buy some active RFID equipment to start doing some tests on this new technology, as it seems to have a really high potential [50].

18.3.2 CMB

Contact Memory Buttons are coin-shaped devices that offer a complementary solution to RFID passive tags for its usage in on board aircraft tags [51] . They are more robust and therefore they are more suitable for unpressurized areas, as Airbus plans to deploy them. They are completely passive and assure an inherent level of security, and they can retain their data in their 64Kb EEPROM memory for 100 years between uses.

Figure 18.3: CMB attached to a traditional identification plate

18.3.3 GPS

When an accurate location of assets is required, GPS still remains as the most suitable choice. In case location of assets is only required for in-house purposes, GPS is not necessary as the readers distributed all over the factory are enough to ensure an acceptable level of accuracy, but assets may be required to be tracked in external factories (i.e. subcontractors, providers) where no location system is used, or while they are being transported. Using GPS would mean having a GPS receiver that would obtain its position and emit it to the place where it will be tracked. This could be done using 3G or GSM traditional systems, but 3G offers more efficience and better prices, as there are currently many studies done in push-pull architectures for these kind of uses.

18.4 Sector Expansion

As explained in the marketing plan, AIRFID has selected the Aerospace sector because it is the most attractive niche market to explore, but it there are some circumstances that may force the company to target other sectors. After some years building a brand image in the aerospace sector, it may appear the possibility to obtain an interesting contract in another sector, and this option will be studied thoroughly, as it is likely that more human capital is needed for such a strategy. Nevertheless, it must also be considered as an option the fact of not being successful in penetrating the aerospace sector, and in this case entering another sector won't be seen as an expansion but as a change of segmentation and strategy.

18.4.1 Pharmaceutical Industry

The pharmaceutical industry has the right features to be considered an attractive sector to target: it has a lot of financing capabilities, a huge amount of products to track and an open mind for new systems that add value. As a matter of fact, the forecast of the average annual growth of RFID in the US pharmaceutical industry in the period 2007-2012 is 60% [52].AIRFID could enter this market by three different ways: working directly with the pharmacies, with hospitals or with the pharmaceutical distributors. Currently there are more than 2200 pharmacies [53]and 93 hospitals [54] in Andalusia, which seems a fair market to target. Regarding the distributors, AIRFID could target CECOFAR, the largest medicine distributor of Andalusia.

Figure 18.4: RFID tag attached to a medicine

18.4.2 Logistics

RFID is specially attractive for logistics, as it automatically registers the arrival and departure of goods without the need to do any paperwork. This could be applied not only to the reception of materials, but also in the billing process, which would definitely result in a lower amount of staff required and a smaller amount of queues in the big shopping centres. Therefore, AIRFID could offer its services to large retailers of Andalusia. The best possible campaign is the case of Walmart, which started spending a huge amount of money in RFID technology back in 2004 as they saw clearly that it was an important tool to cut costs, even with the much higher prices of tags of those years.

18.4.3 Other sectors

The number of sectors where RFID has good opportunities is huge, as explained in Chapter 3. Previously, the most interesting ones for AIRFID have been explained, but many others could also offer an attractive possibility when trying to diversify the company's activities. The following list contains some other sectors that are also interesting:

- Product Manufacturing
- Parking access and Control
- Healthcare Applications
- Human and Animal Identification
- Telemetry
- Transportation Payments

Chapter 19

Risk Management

19.1 Introduction

Like any major system implementation or process-reengineering project, there are numerous risks surrounding RFID. By risk we understand an incident or occurrence with a potential negative impact on the achievement of objectives and on the value creation or preservation.

These risks can emanate from internal and/or external sources and have a direct and/or indirect impact on the company's tangible and intangible assets, such as company's market value, earnings, reputation, employees, etc.

By objectives we understand the targets to be achieved defined in e.g. company's vision and values, the corporate strategy, the annual operative cycle, the annual financial statements, programs/projects and all business activities and processes.

In order to manage these risks it is necessary to develop and implement through the years a Risk Management Process, an iterative and systematic process that consists of four main steps: Identification, Assessment, Response and Monitoring & Reporting [55].

19.2 Risk identification

The purpose of the Risk Identification is to determine all risks related to the project as early and precisely as possible, and once risks have been identified the next step consists of grouping them across different categories, with the purpose of identifying the main areas.

After a preliminary study before starting running the business we have found 54 risks related to our project. The different areas through which they

have been grouped across and that could be in need for action are:

- Contract.
- Customers.
- Financing.
- Organization.
- Planning.
- Resources and skills.
- Suppliers.
- Market.
- Product.

Due to the extensive amount of risks, both their identification and their assessment (which evaluation will be described in the next section) are shown in Table 19.1.

	Risks	Prob.	Imp.	PRI
	CONTRACT			
1	Modifications or cancellations due to influences of other companies in the sector (e.g. Airbus).	1	4	4
2	Pass/fail criterias not very well defined for the fulfilment of the project milestones e.g. payment milestones.	2	3	6
3	The requirements of various specifications (e.g. system, material, equipment) are inconsistent.	1	3	3
	CUSTOMERS			
4	Customer's organization not very well understood.	2	2	4
5	Interference of the customer in operational issues.	2	1	2
6	Interference of the customer in our supplier's relationship	1	2	2
7	Insistence on new requirements.	4	3	12
8	At the last moment, the customer does not like the product, so it must be re-designed and re-built.	2	4	8
9	The customer does not accept the software provided, even though the product fulfills all the required specifications.	1	3	3
10	The time spent by the client to communicate is longer than expected.	1	3	3
11	The customer takes more time than agreed to pay.	3	4	12
12	The customer requests monetary guarantees.	2	4	8
13	Not very clear customer´s requirements.	2	4	8
14	The customer does not want to work with milestones.	2	3	6
15	Non payment after a pilot project.	2	4	8
16	The client requires us to fund the project.	2	4	8

Table 19.1: Risk Identification and Assessment

	Risks	Prob.	Imp.	PRI
	FINANCING			
17	Risk of changes of exchange rate for the expenses of e.g. material, labour, etc.	1	3	3
18	Risk of changes of inflation which might impact material, labour costs, etc.	2	2	4
19	Risk of financial loan rate changes.	1	3	3
20	Issue of credibility by the customer.	3	3	9
21	Risk of changes in the VAT.	4	1	4
22	Excessive guarantees required for fulfilling contracts requirements.	2	4	8
23	Difficulties in getting financing at any point of the project.	3	4	12
24	Risk of unpaid.	3	4	12
	ORGANIZATION			
25	The project organization does not integrate all the functions from acquisition to closure (e.g. procurement, contracts to support the project, etc.)	2	3	6
26	Roles and rules for the project teams not well defined and/or communicated.	1	3	3
27	Vital dependence of some member of the company.	3	4	12
28	Lack/Excess of capacity in the case of rapid/slow growth.	2	2	4
29	Someone in the company abandons the project before its completion.	2	3	6
	PLANNING			
30	Greater effort than expected (line codes, etc.).	3	2	6
31	A delay in one task causes cascading delays in dependent tasks.	2	4	8
32	Existence of any delay on our side.	2	4	8
33	Existence of any delay on our client's side.	1	3	3
34	Existence of long lead items.	2	2	4
35	Performance demonstrations planned only at the end (Customer integration).	1	3	3
36	The Client requires us to demonstrate them the product and it is not on time.	3	3	9
37	Not being able to meet the delivery of turnkey project.	3	4	12

Table 19.1: Risk Identification and Assessment

	Risks	Prob.	Imp.	PRI
38	Re-prioritization of the project imposed by one specific customer e.g. regarding resources?	3	3	9
	RESOURCES AND SKILLS			
39	Non-availability of manpower.	1	3	3
40	People without the right skills to perform their tasks.	2	3	6
41	An expert is required for a specific task.	3	3	9
42	Excess or lack of capacity because the client lengthens or shortens delivery times.	2	3	6
43	Non-availability of the infrastructure of the company (building, rooms, communications) at first.	1	1	1
	SUPPLIERS			
44	Unavailability of qualified suppliers for equipment, components and material.	1	4	4
45	The supplier cannot provide us equipment, components and material in the set period.	1	3	3
46	The supplier does not want to share risks.	3	2	6
47	The supplier provides unacceptable quality material, so we have to add extra time to improve quality.	1	3	3
	MARKET			
48	Loss of customer portfolio due to our salesperson drain.	2	3	6
49	Difficulty in reaching the expected market share.	3	4	12
50	Selection by the customer of a competitor with more experience.	4	3	12
	PRODUCT			
51	Our product does not completely satisfy our customer's requirements.	3	4	12
52	Lack of pre-designed products (Limited portfolio).	4	3	12
53	Appearance of a new technology or standard.	2	2	4
54	The intended use of the product is not very well known.	2	1	2

Table 19.1: Risk Identification and Assessment

The purpose of this step is to determine on the one hand the impact of the risk over the main objectives of the project that usually are:

- Costs.
- Schedule.
- Performance or quality.

On the other hand it is necessary to determine the probability of occurrence for those risks to materialize and its impact.

In order to do so risks will be scaled like as *Almost certain*, *likely*, *probable* and *unlikely* in terms of probability and as *Critical*, *high*, *medium* and *low* regarding impact.

Once these factors have been evaluated we will prioritize the risks by using what is termed as a Project Risk Index Matrix (PRI), which is built through the product of its probability and impact. In our case we have build a 4x4 matrix as the one shown in Figure 19.1.

PRI		Probability			
		Almost Certain	Likely	Probable	Unlikely
Impact	Critical	Very High 16	High 12	Medium 8	Low 4
	High	High 12	Medium 9	Medium 6	Low 3
	Medium	Low 8	Low 6	Low 4	Low 2
	Low	Low 4	Low 3	Low 2	Low 1

Figure 19.1: Risk Assessment: PRI Matrix Example

Taking into account the product between their impact and their probability (see Figure 19.1) the PRI matrix obtained as it is shown in Figure 19.2.

As it can be seen in Figure 19.2 all the risks to which our company is exposed can be grouped in four different levels of increasing severity (Green, yellow, orange and red cells).

In the next section we will discuss the response to take for the most severe risks classified as the Top Ten and ranked as high severity (PRI 12, orange cell), as it is shown in Figure 19.2.

PRI		Probability			
		Very high	High	Medium	Low
Impact	Critical		11, 23, 24, 27, 37, 49, 51	8, 12, 13, 15, 16, 22, 31, 32	1, 9, 44
	High	7 50 52	20, 36, 38, 41	14, 25, 29, 40, 42, 48	3, 10, 17, 19, 26, 33, 35, 39, 45, 47
	Medium		30, 46	4, 18, 28, 34, 53	2, 6
	Low	21		5, 54	43

Figure 19.2: Risk Assessment: PRI Matrix

19.3 Risk response

There are four basic response strategies, namely:

- **Avoid:** An appropriate decision in those cases where business activities contain risks that could have a high impact on other business activities.

  Examples of avoiding risks: stop activity, divestment of operations, change of objectives, change of scope or scale of activities, and so on.

- **Transfer:** The impact of a risk can be limited and/or completely reduced by transferring the potential losses/liabilities to third parties.

  Examples of transferring risks: contract insurance, outsource specific risky processes, diversify investments or transfer the risk to subcontractor.

- **Mitigate:** The occurrence and impact of a risk can be limited by mitigation actions. It is important to make a difference between mitigation actions that can be taken to prevent the risk from occurring, that is, *preventive actions*, and actions that can be taken to reduce impact once the risk has materialized, that is, *contingency actions*. Preventive actions work on the cause of the risk while contingency actions on the effect of the risk.

  Examples of mitigating risks: improve processes and procedures, negotiate with customer, monitor budgets/forecasts or define areas of accountability and objectives.

- **Accept:** The risk as well as related impact, is accepted by the respective management. The decision to accept a risk should be made based

on an analysis and has to be documented. It is crucial to monitor the accepted risks and regularly re-assess those, especially when the decision basis has changed.

Examples of accepting risks: those when insurance rate is higher than the probable financial impact of the risk.

Although it should be taken a specific response for each risk listed in Figure 19.1, in the present business case we are just going to evaluate the response for each risk in the Top Ten. The responses that we believe most appropriate are shown in Table 19.2 and will be explained in detail below.

Top 10 Risk	**Response**
CUSTOMERS	
(1) Insistence on new requirements	Accept
(2) The customer takes more time than agreed to pay	Avoid
FINANCING	
(3) Difficulties in getting financing at any point of the project.	Transfer/Mitigate
(4) Risk of unpaid.	Avoid/Mitigate
ORGANIZATION	
(5) Vital dependence of some member of the company.	Mitigate
PLANNING	
(6) Not being able to meet the delivery of turnkey project.	Mitigate
MARKET	
(7) Difficulty in reaching the expected market share.	Mitigate
(8) Selection by the customer of a competitor with more experience.	Mitigate
PRODUCT	
(9) Our product does not completely satisfy our customer's requirements.	Avoid
(10) Lack of pre-designed products (Limited portfolio).	Mitigate

Table 19.2: Top 10 Risk Response

1. **Insistence on new requirements**

   We would treat this risk as an Accept Response since our company's policy consists on being as much flexible as possible in order to satisfy every customers' need, as long as the Client pays for any new requirement unspecified on the contract.

2. **The customer takes more time than agreed to pay**

   This type of risk is one of those risks that should be avoided under any circumstances. In such cases the company's manager should find some alternatives in order to be paid, so we can be able to meet our duties of payments with our suppliers and employees, among many other expenses.

   A source of getting financing could be made by contracting an insurance policy with a bank or a confirming house in order to compensate us for losses we may suffer as a result of the total or partial non-payment of credits acquired with our client. This is what is termed as *confirming* and would be an useful instrument to be paid on time although the client is not able to pay.

   Besides this risk there is one similar risk that is that we could take more time than agreed to pay to our suppliers. In that situation we should contract what is termed as *factoring*, where an insurance policy is contracted with a bank or a factoring house in order to compensate our suppliers for losses they may suffer as a result of the total or partial non-payment of credits on our side. Obviously that option should be used in specific situations since later we should have to meet the payment of the invoice as well as the payment of the fees of the insurance contract.

3. **Difficulties in getting financing at any point of the project**

   On the one hand, once all possibilities of getting financial support have been studied and/or applied, if there were difficulties in getting financing at any point of the project we would try to transfer this risk to our suppliers by asking for them to pay for the equipments and getting their money back until we have been paid by our clients.

   On the other hand another option could consist of mitigating the risk by defining more accurately the milestones of the project so we can make a better profit from the milestones of payment and thus to be able to meet our duties according to the Cash-Flow requirements.

4. **Risk of unpaid**

   The risk of being unpaid can be mitigated at first by investigating the solvency of our customers before hiring any new service. If the solvency of our Client can not be verified any kind of business with them should be avoided.

5. **Vital dependence of some member of the company**

Obviously this risk should be mitigated by using as many means as possible. For instance a common server will be available to the top management of the company in order for them to upload all the information they have about suppliers, customers, strategies and so on. Furthermore, regular meetings will take place in order to share information between the different members of the company. With that kind of measures we will try to mitigate huge dependences on any member.

6. **Not being able to meet the delivery of turnkey project**

   Delays in meeting the delivery of a turnkey project could become a real and serious risk. Their consequences are very well known: lack of company's reputation, penalties or lack of quality service or product. In order to mitigate so, preventive actions like subcontracting processes (software development, product installation, etc) should be carried out.

7. **Difficulty in reaching the expected market share**

   Before taking any response the cause of risk should be found. We should figure out whether the origin of that risk is due to our competitors are getting our expected market share or whether companies from the aeronautical sector are not hiring RFID technology for their activities.

   In the first situation we should have to know what we are doing wrong, e.g. price, experience or the geographical area where we are running our business. In that cases we could mitigate the risk by carrying out a more aggressive promotion strategy (e.g. at place demonstrations, offering pilot projects for free, etc) or by bringing forward the implementation of our Expansion Plan, expanding our area of operations to other aeronautical clusters or by offering new products and services.

   If we had to face the second situation we would not have more alternatives to mitigate that risk than just changing the aeronautical sector where we are focused in by other sectors more willing to use RFID technology.

8. **Selection by the customer of a competitor with more experience**

   To mitigate this risk we could take different actions like e.g. offering a much more competitive offer, assuming the risks if something goes wrong or offering guarantees in form of penalties by assuring them that our product will be able to satisfy their requirements. Anyway we should insist on demonstrating that we have a deep knowledge about our product and offering an integral solution to their needs for locating parts, even when the Client does not know how to solve it.

9. **Our product does not completely satisfy our customer's requirement**

   The fact that our product does not completely satisfy our customer's expectations is a risk that we have to try to avoid by being flexible and offering to our clients the solution that they really need, modifying if

needed our product as long as the Client pays for it. In order to avoid this sort of situations we should take into account doing some R&D of new technologies in our Expansion Plan as well as intensifying the R&D activities predicted according to the Human Resources Plan, so we can offer an integral solution to our customer's needs to trace items.

10. **Lack of pre-designed products (Limited portfolio)**

    Although it is an important risk it should be considered as a short-term risk since as time goes by we are supposed to expand our portfolio. In order to mitigate that risk the commercial manager of the company will have to seize the opportunity during the first 6 months from the launch of the company to figure out what the most common needs of our customers are, in order to include them in our portfolio. By being flexible in our products we will be able to mitigate this kind of risks.

19.4 Risk monitoring and reporting

As AIRFID is a new creation company the risks that have been previously analyzed are those which are the most expected to appear during the first steps of our company.

But, since initial risk management plans are never perfect, the logic and correct way to proceed would imply periodical revisions and evaluations of risks in order to correct any possible deviation from this initial evaluation. In Risk Management this procedure is termed as *Risk monitoring and reporting.*

The main purpose of risks monitoring and reporting is:

- To identify, assess and plan for newly emerging risks.
- To systematically review and update risk data based on the risk register (see Figure 19.1)
- To track and control risks response actions and their effects.
- To monitor contingencies and the movements in the risk budgets.
- To track the implementation of fallback plans.
- To document, verify and report the status of risk management.

Risk monitoring and reporting meetings should be convened by the General Manager and celebrated regularly (monthly, quarterly,), more often during the early stages of the company or whenever special circumstances so require.

As Risk Management is a personal duty of every member within our company thus several roles and responsibilities must be distributed among them.

The General Manager will act as what in Risk Management is termed as *Project and Risk Manager*. He will be overall accountable for the success of the project and the implementation of the Risk Management Plan. Among his many duties as Project Manager he will be responsible for integrating, establishing and maintaining the Risk Management Plan and actively fulfilling the Risk Management requirements, especially for identification, assessment, response, allocation and monitoring risks. While as Risk Manager he will have to customize the risk process to manage risk together with what in Risk Management is termed as *Risk owners* (in our case this figure will be represented by the heads of the Commercial, Engineering&Design and Operational Department) in order to establish and use an appropriate risk register data, to incorporate lessons learnt from previous phases and other projects as well as to customize the risk management process and to perform regular risk meetings.

Risks detailed in Figure 19.1 will be allocated to the Risk Owners, who will have to perform and coordinate all the necessary activities in the risk process such as assessment, response, monitoring and reporting, as well as taking specific risk response actions for responding to a risk in our project, having to implement this action proactively until action closure.

Thus the risk management of the different areas through which risks have been grouped will be distributed as follows:

- Contract, Financing, Organization and Resources and skills: General Manager.
- Customers and Market: Head of Commercial Department.
- Planning and Suppliers: Head of Operational Department.
- Product: Head of Engineering & Design Department.

Nevertheless, it is reasonably sure to appear some overlaps between different areas, so many risks will be managed jointly.

19.5 Turnaround management

Finally, as long as the company is facing severe cash crisis and the risk management system implemented is not sufficient to solve the situation, the Board of Directors of the company should have in mind the implantation of a Turnaround Management [56].

When a firm faces severe cash crisis or a consistent downtrend in its operating profits or net worth, it is on its way to becoming insolvent. The survival of the company could be prevented unless appropriate actions on its systems and operations, both internal and external, were initiated to change the future prospects.

This process of bringing about a revival in the company's fortune is what is termed as *Turnaround Management*. It usually consists of 3 phases, namely:

1. The diagnosis of the impending trouble or the danger signals.
2. Choosing an appropriate Turnaround Strategy.
3. Implementation of the change process and its monitoring.

Phase I: Watching out for the danger signal

Companies become sick slowly but in reality, most of them do not recognize this fact. Some of the universally accepted danger signals, which a company should watch out for, are listed below:

- Decreasing market share / Decreasing rate sales.
- Decreasing profitability.
- Increased dependence on debt / Restricted dividend polices.
- Failure to plough back the profits into business / Wrong diversification at the expense of the core business.
- Lack of planning.
- Inflexible Managers / Unquestioning Board of Directors.
- A management team unwilling to learn from competitors.

Phase II: Choosing appropriate Strategy

Turnaround Management could be divided into two broad categories:

- *Strategic Turnaround* As the name itself suggests, strategic turnaround choices may force the company to completely change its current way of operations. The choices under this method could be:
  1. A new way to compete in the existing business.
  2. Entering into an altogether new business.
- *Operating Turnarounds* Basically there are 4 types and the strategy adopted will depend on the various situations in which the firm could be. All these strategies focus on short-term effects only.
  1. Asset reduction strategies
  2. Revenue increasing strategies
  3. Cost cutting strategies

4. Combination strategies

Phase III: Implementation of the change process

Finally, although implementation plays an important role in any turnaround management, the identification of an appropriate strategy by itself does not guarantee success as well as partial adoption of a strategy is also not useful.

The selected strategy will need to be pursued persistently and with all effort to make it work. The success or otherwise of a Turnaround strategy will depend on the commitment shown by the top management as also the operating management.

It can be thus seen that for Turnaround management to be implemented, it is imperative for the management to be aware of its position in the industry.

The search of a reputed Turnaround Management Consultancy will play an invaluable part here since they could help in identifying and vetting the strategy in the light of the prevailing situations, thus ensuring effective turnaround in the organization.

Chapter 20

Conclusions

This Business Plan describes all the aspects of AIRFID S.L., a technological company that offers RFID solutions in the Andalusian aeronautical sector. The objective of this document is to prove the viability and profitability of this business in order to find the necessary support from economical institutions, donators of subsidies and other investors aiming to take part in this ambicious project.

These are the highlights of the business plan:

- **Mission:** "To extend the benefits of RFID technology in the Andalusian Aeronautical Sector".
- **Vision:** "To become the leaders in RFID solutions in the Spanish Aeronautical Sector".
- **General Strategic Objective:** To obtain a 1,5 million € revenue by the fifth year.
- **Products and Services:** Customized "Turnkey" projects made against delivered milestones.
- **Niche Market:** Andalusian aeronautical sector.
- **Competitive Advantage:** Knowledge of the sector, high technical skills and flexibility in the applications.
- **Proposed set-up of the Venture:** July 2010.
- **Location:** Seville.
- **Required Workforce:** From 8 employees in Year 1 to 17 employees in Year 5.
- **Expected Annual Average Sales from years 1 to 5:** 850.000€.
- **Expected Annual Average Profit from years 1 to 5:** 41.000€.

- **Projected Time to Break-even:**Year 2.
- **Projected Average ROE:**13%.
- **Initial Investment:** 200.000€.
- **Investment Sources:**100.000€ of capital stocks and 100.000€ of a long-term loan through ENISA.

AIRFID S.L. is born as a response to the current overcosts and delays from the aeronautical sector, taking advantage of the exponential growth of RFID in a large number of sectors in different industries. Moreover, it takes advantage from the recent publication of RFID specifications of the main aircraft manufacturers. This project aims to benefit from the "First Mover Advantage" that will place the company in a predominating position in the RFID aeronautical market.

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Appendix A

Aeronautic companies in Andalusia

In 2009 there was 145 aeronautic companies in Andalusia. These are companies related to the aeronautic industry and those with the company tax code registered in "Comunidad Autnoma Andaluza".

Aeronautic industry means participation, either in product or services, related to the manufacturing of military or civil aircrafts in any possible phase, aircraft maintenance and aviation in general.

Beginning 2009, the list of main aeronautic companies in Andalusia is the following:

Company	Main Activiy
A&G Sevilla	Services
Aercal	Mechanical activities and tooling
Aernnova	Assembly
Aero-Avance	Engineering
Aeropoxy	Composite materiales
Aeroestructuras Sevilla	Assembly
Aeropolis	Services
Aerosur	Assembly
Aertec	Engineering
Aicia	Technical Analysis
Airgrup	Mechanical activities and tooling
Alestis	Assembly
Altran	Engineering
Assystem Iberia	Engineering
Canagrosa	Technical Analysis
Cesa	Assembly
Computadores Modulares	Electric & Electronic
Consur	Mechanical activities and tooling
Easy Industrial Solutions	Composite materials
EITT	Electric & Electronic

Elimco	Electric & Electronic
Emerge	Engineering
Faasa	Aeronautic
Fada-Catec	Engineering
Flight Training Europe	Aeronautic
Fundacion Helice	Engineering
Galvatec	Mechanical activities and tooling
Ghenova	Engineering
Grupo Simgi	Mechanical activities and tooling
IAT	Engineering
Inasmet	Technical Analysis
Indalo	Services
Inespasa	Mechanical activities and tooling
Infasur Aeronautica	Mechanical activities and tooling
INTA	Technical Analysis
IntecAir	Mechanical activities and tooling
ITP	Assembly
LTK Andalucia	Services
LTK 400	Services
Mave Aeronautica	Mechanical activities and tooling
MDU	Engineering
Mecanizados Iiguez	Mechanical activities and tooling
Mecanizados y montajes Aer.	Mechanical activities and tooling
Mecaprec	Mechanical activities and tooling
Mecatecnic	Mechanical activities and tooling
Mesima	Mechanical activities and tooling
Meupe	Mechanical activities and tooling
MP Componentes Mecanicos	Assembly
Navair	Electric and Electronic
Prescal	Engineering
Prodipro	Mechanical activities and tooling
SACESA	Composite Materials
Sertec	Engineering
Servimec	Mechanical activities and tooling
Sevilla Control	Mechanical activities and tooling
SK10 Andalucia	Assembly
SK 3000 Aeronautica	Assembly
SLI	Services
SMA	Mechanical activities and tooling
Sofitec Ingenieria	Engineering
STSA	Mechanical activities and tooling
Surimex	Assembly
Tada	Mechanical activities and tooling
Tagonsa	Mechanical activities and tooling
Talleres Garrucho	Mechanical activities and tooling
Talleres J. Paez	Mechanical activities and tooling
Teams	Technical Analysis
Tecaer Sevilla	Engineering

Tortesa	Services
TRC	Mechanical activities and tooling
UMI	Mechanical activities and tooling

Appendix B

Case Study: Wal-Mart's Race for RFID

By Mark Roberti September 15, 2003

Wal-Mart's new push to require its top 100 suppliers to use RFID tags on cases and pallettes of consumer goods shipped to its distribution centers and stores by January 2005 will give the sensor technology its first broad, real-world test. There are cost, technology and privacy concerns related to the broader use of these sensors, but Wal-Mart's mandate represents a commitment to work out the kinks.

On June 11, Linda Dillman dropped a bomb on the retail industry. Wal-Mart Stores Inc.'s CIO announced that, as of January 2005, the world's largest retailer would require its top 100 suppliers to put radio frequency identification (RFID) tags on all pallets and cases they ship to its distribution centers and stores. The news sent suppliers and competitors scrambling to learn about the wireless technology, which enables companies to identify and track items in the supply chain automatically.

Then less than a month after Dillman's bombshell, just as executives were beginning to grasp what it would mean for the retail industry and for suppliers, news reports revealed that Wal-Mart had cancelled a "smart-shelf" trial with The Gillette Co. The trial would have used RFID technology to monitor how many razor blades were on a store shelf in Brockton, Mass. Many media stories took this to mean that Wal-Mart was backing off its commitment to deploy RFID in stores because of concerns raised by privacy advocates.

Wal-Mart declined to comment on why it pulled the smart-shelf test. But deploying RFID in stores has never been a top priority for the retailer. In fact, Wal-Mart had delayed the trial numerous times since January, to the frustration of Gillette executives.

The trial was conceived as an experiment to see what kind of real-time

information could be gathered so that Wal-Mart and Gillette could begin to figure out how to use the data. Both companies knew it would not be economically viable to deploy the technology widely in stores for several more years. And Wal-Mart didn't want to disrupt its in-store operations. Even a small test of the smart shelf would require resources to support the technology and personnel to make sure the test boxes and regular boxes, which look alike, didn't get intermingled.

Did negative press reports about the potential of using RFID to track consumers' actions play a role? Again, Wal-Mart would not comment on this. But it's quite possible that the conservative company didn't want to risk the ire of privacy advocates over a trial that wasn't critically important.

But the cancellation of the trial in no way undermined Wal-Mart's commitment to RFID. To stem confusion in the industry, Wal-Mart hastily sent a letter to its suppliers letting them know that the retailer remained committed to tracking pallets and cases with RFID technology beginning in 2005. Wal-Mart spokesman Tom Williams said the company wants to devote its attention to its ambitious plan. "By 2006, we will roll it out with all suppliers," says Williams.

Industry experts believe that, given the huge commitment of IT and operational resources necessary to fulfill its mandate, Wal-Mart could not afford to be distracted by a smart-shelf test that wouldn't reap any immediate benefits. Edward Rerisi, director of research at Allied Business Intelligence Inc., a market research company that focuses on wireless technologies, says he doesn't believe "anyone should read anything into" Wal-Mart's decision to back out of the smart-shelf pilot. "It was two separate applications, two separate projects," says Rerisi. "You can't evaluate them in the same light." For the past two-and-a-half years, Wal-Mart has been working with the Auto-ID Center, a nonprofit research organization based at the Massachusetts Institute of Technology, to develop and test RFID technology that will allow companies to track goods using a universal Electronic Product Code (EPC). The Auto-ID Center's long-term vision is for companies to use smart shelves to monitor how many items are on each shelf. When inventory is low, software would signal a store manager that, say, more Tide detergent or Kellogg's Corn Flakes needs to be brought from the storeroom. Readers in the storeroom would monitor inventory and alert the distribution center when more product is needed, and so on back through the supply chain. But Wal-Mart and other sponsors of the Auto-ID Center have always envisioned that it might take as long as ten years before RFID tags would become inexpensive enough to put on individual items in stores.

Many questions remain about how RFID technology will be deployed, such as what information will be shared between Wal-Mart and its many suppliers, and how companies will track goods with both bar codes and RFID tags during the transition period. But Wal- Mart is moving to deploy it at the pallet and case level, even before all the answers are known, because the technology has the capability to improve efficiency, cut costs and boost

sales.

Dillman's announcement caught many competitors and suppliers off guard. RFID has been used successfully in closed-loop supply chains, where a retailer, such as Britain's Marks & Spencer Group, sells everything under its own brand. But most people thought the proposed EPC standard, which won't be formally introduced until this month, was still too new and too immature to be adopted in open supply chains. At a recent trade association meeting for consumer products manufacturers, suppliers were concerned about just how much time they have to comply. "Wal-Mart plans to hold a gathering for suppliers in November, but that leaves us less than a year to do this. We won't want to deploy new technologies in November and December, because that's the big selling season," says a senior executive at one of Wal-Mart's largest suppliers, who asked not to be identified. The importance of Wal-Mart's decision is hard to overestimate. "You can count on one hand the number of retailers big enough to force a whole industry to adopt a new technology within a constrained amount of time," John Fontanella, vice president of research at AMR Research wrote in a recent report. "Wal-Mart is biggest of them all." Many people now expect RFID use at the pallet and case level to take off rapidly because of something economists call the "network effect," which basically says that the more people use a physical network (say, the Internet) or shared service (eBay), the more valuable it becomes. That encourages even more people to use the network, creating exponential growth.

The Wal-Mart RFID mandate means its top 100 suppliers not only have to put tags on pallets and cases, they must also install RFID readers in their manufacturing facilities, warehouses and distribution centers. They, in turn, can require their suppliers to tag shipments and so on through the supply chain. Since Wal-Mart sells auto parts, clothes, groceries, pharmaceuticals and entertainment products, the network can quickly spread to many industries. And as more suppliers adopt the technology, it will make more sense for other retailers to take advantage of RFID, which will drive down the cost of tags and readers, encouraging still more companies to jump in.

Today, RFID tags cost anywhere from 40 cents to a dollar, depending on the size of an order and the features of the tag (amount of memory, whether it is read-only or read-write and so on). This cost will be borne by Wal-Mart's suppliers. Could they refuse to comply with the retailer's demands? "You can't do that if 10 percent to 40 percent of your business is going through Wal-Mart," says Pete Abell, cofounder of the ePC Group Ltd., an independent consulting company, and the former head of AMR Research's retail practice. And Wal-Mart's Dillman has said that companies that don't comply will be fined. Wal-Mart is unlikely to back off its requirement, because the retailer is convinced the benefits are huge. Financial analysts agree. Sanford C. Bernstein & Co., a New York investment research house, estimates that Wal-Mart could save nearly $8.4 billion per year when RFID is fully deployed throughout its supply chain and in stores. With those kinds of benefits in sight, it's not hard to understand why the retailer is pushing ahead so aggressively.

The ePC Group's Abell says that in the mid-1980s, when most grocery stores were rolling out bar code technology slowly, Wal-Mart dispatched 70 teams to install scanners in its stores as quickly as possible. And he expects the retailer to do the same with RFID for its supply chain. "They understood that the sooner you got the stores up, the sooner you got the benefits," says Abell. "I see the same thing happening now with EPC technology."

Wal-Mart has been studying the potential of RFID for more than 12 years. It has a facility in Rogers, Ark., in which it tests tags and readers from various vendors and studies how the performance of these products is affected by the environments in its distribution centers and storerooms. Wal-Mart will explain to its suppliers what they need to do to fulfill the retailer's requirements, but after that, they're on their own.

Competitors and suppliers who are just beginning to look at this technology have a huge task in front of them if they want to be fast followers behind the leaders. RFID is not a simple plug-and-play technology. It has improved a great deal with the advent of UHF tags. But while UHF waves can pass through cardboard and paper packaging, they bounce off metal, creating false or failed reads, and they are absorbed by water.

A supplier can't simply slap a smart labelone with an RFID tag embedded in iton 60 cases of coffee cans, stack the cases randomly on a pallet and read every tag as a forklift carries the pallet through a dock door at five miles per hour. Retailers are going to have to figure out sensible solutions for hundreds of products with high water content or that are made of metal. And suppliers may have to follow different compliance requirements for different retailers. Solutions might include using a specific type of tag, placing the tag in a precise location on the case and arranging the cases in a special configuration on a pallet. The changes wrought by RFID systems will affect virtually everyone in the companyfrom the forklift operator to the head of logisticsbut perhaps none more than those in the IT department. The whole point of using RFID is to enable companies to gather real-time data automatically. The challenge will be to figure out ways to filter, use and share that data. EPC tags contain only a serial number. That means for the tags to be of any value, suppliers will have to create a database that contains information about what the item is, where it was made, what its expiration date is. Retailers will need to figure out exactly what information they need, what format it should be in and how it should be shared. Retailers and suppliers will have to work together to solve these issues.

And it's not clear how companies will transition from the universal product code incorporated in bar codes to EPC tags. The Uniform Code Council Inc., which manages the UPC and has taken responsibility for commercializing EPC technology, has not spelled out a clear migration path for retailers, suppliers and software vendors. Bernie Hogan, the UCC's chief technology officer, says the organization has a draft road map. But it wants to work through some actual deployments with companies, such as Wal-Mart, to fine-tune its road map before making it public.

Once a road map is published, software vendors will have to create new fields to cope with the data. Many companies, including Manhattan Associates Inc., Provia Software Inc., RedPrairie Corp. and SAP, are adding software modules or upgrading their products to cope with the serial numbers in RFID tags. But these solutions still require suppliers and retailers to deploy middleware that manages the huge amount of data coming from the readers. CIOs will have to devise ways to filter out false or redundant reads and pass on only useful information to enterprise applications. And they'll have to work with line managers more closely than ever to shape these systems. For instance, IT and business managers will have to figure out when inventory in the storeroom or warehouse needs to be replenished. Set the trigger too low and you'll run out of product; set it too high and you'll wind up with excess inventory.

CIOs at retail companies also will have to work with their counterparts in their supply base to find ways to get product to the stores before the stores are sold out of an item. Studies show that products are out of stock in the grocery and mass-merchandise sector an average of 7 percent of the time. Procter & Gamble Co. has commissioned research that reveals that out-of-stocks on some fast-moving items can be as high as 17 percent. As Wal-Mart pushes forward with RFID technology, the network effect is likely to spread quickly. If P&G is tagging pallets and cases for Wal-Mart, it's not difficult for P&G to do the same for Target Corp. and other retail partners. That provides incentives for other retailers to follow Wal-Mart's lead.

And the benefits of RFID won't be limited to the retail and consumer goods industries. Wal- Mart is the world's largest tire retailer. The Transportation Recall Enhancement, Accountability, and Documentation (TREAD) Act requires automakers to be able to uniquely identify tires on cars from the 2004 model year, so the tires can be recalled more effectively. If Wal-Mart uses EPC tags on tires, it would make sense for automakers to use the same tags, which will be less expensive than specialized tags produced in much smaller volumes.

As more companies adopt the technology, the price of RFID tags and readers will drop sharply and all kinds of new applications will become economically viable. Manufacturers will be able to put tags on parts to enable them to more efficiently customize their products. Pharmaceutical companies will be able to ensure that their drug products are not counterfeited. Farm products will be tracked from the stable to the table, ensuring freshness and the ability to quickly recall tainted meat. The improvement in productivity will dwarf the gains seen during the Internet era. But given the complexity of implementing this technology, companies that don't move quickly will wind up at a severe competitive disadvantage.

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The ability to know where every item is in the supply chain and store

could save retailers billions of dollars per year. Here's an estimate of what Wal-Mart might save annually when RFID technology is deployed throughout its operations.

$6.7 Billion: Eliminating the need to have people scan bar codes on pallets and cases in the supply chain and on items in the store reduces labor costs by 15 percent. $600 Million: Even with the most efficient supply chain on earth, Wal-Mart suffers outof- stocks. The company boosts its bottom line by using smart shelves to monitor on-shelf availability. $575 Million:Knowing where products are at all times makes it harder for employees to steal goods from warehouses. Scanning products automatically reduces administrative error and vendor fraud. $300 Million: Better tracking of the more than 1 billion pallets and cases that move through its distribution centers each year produces significant savings. $180 Million: Improved visibility of what products are in the supply chain-in its own distribution centers and its suppliers' warehouses-lets Wal-Mart reduce its inventory and the annual cost of carrying that inventory. $8.35 Billion: Total pre-tax saving is higher than the total revenue of more than half the companies on the Fortune 500.

Why Wal-Mart's supply chain is so successful?

The key to Wal-Mart's supply chain.

Wal-Mart is committed to improving operations, lowering costs and improving customer service. But the key to retailer Wal-Mart's success is its ability to drive costs out of its supply chain and manage it efficiently. Many supply chain experts refer to Wal-Mart as a supply chain-driven company that also has retail stores. Wal-Mart's company philosophy ('The Wal-Mart Way') is to be at the leading edge of logistics, distribution, transportation, and technology. The Wal-Mart business model would fail instantly without its advanced technology (Wal-Mart has the largest IT systems of any private company in the world) and supply chain (Wal-Mart has made significant investments in supply chain management).

Wal-Mart's business model and competition

Wal-Mart's business model is based on a low price strategy and low transportation costs allow it to sell its products at the lowest possible prices. In return for its strategy (Everyday Low Price Strategy), Wal-Mart's suppliers - both large and small - either break even or make profit supplying at Wal-Mart's stores. But the real winners are Wal-Mart's customers (approximately 175 million every week) who save thousands of dollars buying at low prices. Since Wal-Mart stores began selling groceries almost three dozen regional grocery suppliers have struggled to match or simply run out of business. Last year, Wal-Mart's annual sales were $350 billion and it had more than 7,000 stores, 120 distribution centres and operations spanning 15 countries. Nearly two million employees at Wal-Mart focus on cost, customers and continuous improvement on a daily basis. Other major retailers like Target and Home Depot have emulated Wal-Mart's logistics strategies and actics.

Wal-Mart's one-store-at-a-time, RFID and just-in-time distribution approach.

Every Wal-Mart store operates like a small company. Store managers are trained to manage one store at a time, one department at a time, and one customer at a time. Decisions are made by store teams to make the individual stores operate at its best with superior in-store execution. With established vendor partnerships with top manufacturers, Wal-Mart has implemented advanced logistics solutions like RFID (radio frequency identification). RFID solutions help maintain lower costs, identify out-of-stocks and increase sales. Distribution centres instead of warehouses, automated replenishment and cross-docking technology also reduce inventory carrying costs.

Appendix C

Monthly cash flows

In this appendix the monthly cash flows for the different scenarios are shown. They describe the different inputs and outputs for the first two years of opearations. This study reflects a more accurate reality, as it considers a Payment Period of 90 days as well as a Collection Period of 90 days too. Also, contracts are signed in a month that has been determined randomly, except for the first contract, that is subject to product development. This permits us to see a more realistic cash flow for the first two years.

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