



UNIVERSITÉ EUROPÉENNE DU TRAVAIL

Sous la conduite de
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Changes in the aeronautics sector – the case of Airbus in Midi-Pyrénées

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Summary

The aeronautics industry is a sector undergoing massive changes despite of a current period of strong growth. Now, this industry plays a key role in Midi-Pyrénées with around 14,000 employees spread out within about twenty manufacturers, and more than 500 regional establishments partners of this activity.

This case study deals with the strategy of all actors from the aeronautics industry, through the example of the industry in Midi-Pyrénées. It recalls the changes which occurred in the industrial approach of the main principal Airbus to show its consequences on the whole industry: major evolutions in the relationships with subcontractors, reorganisation of the industry, new adaptation/anticipation strategies, adjustment of the work load, transfer of the risks towards inferior levels of subcontractors... Lastly, the study takes an interest in the action of public authorities which initiated with success an interesting approach of collaboration and innovating measures in terms of accompanying of the industry.

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**“CHANGES IN THE AERONAUTICS SECTOR:
THE CASE OF AIRBUS IN THE MIDI PYRENEES”**

Case study on behalf of the UET
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Airbus is the leading European aeronautics manufacturer and one of the two main suppliers of commercial aeroplanes in the world, with a turnover of €22 bn in 2005.

When it was established in the 1970s in the form of an economic interest group, the consortium of European aeronautics manufacturers included, Aérospatiale (France) and Deutsche Airbus (Germany), later joined by CASA (Spain) then British Aerospace in 1979. The launch of new programmes and the consolidation of the European aeronautics industry brought about a transformation in the legal structure of Airbus. Thus in 2001, the consortium became an integrated company – AIRBUS SAS – 80% owned by EADS – European Aeronautic Defence and Space Company – and the remaining 20% by BAE – British Aerospace Systems. However, the British shareholder is now holding discussions to transfer its 20% share in the capital of Airbus to EADS.

Airbus is currently a fully-integrated company made up of 5 “NatCos” (National Companies): Airbus Central Entity (head office), Airbus France (Toulouse, St-Nazaire, Méaulte and Nantes in France), Airbus UK (Filton and Broughton in the United Kingdom), Airbus Deutschland (Hamburg, Bremen, Stade, etc. in Germany), and Airbus España (Madrid, Illescas, Puerto Real in Spain).

Airbus employs 55,000 people in the various European countries, including over 10,000 in France at 4 sites and around 4,000 people at the head office in Blagnac.

Aeronautic construction therefore plays a leading role in the Midi Pyrénées even though it is one of the smallest industries in France – accounting for less than 4% of industrial employment

in 2003. It employs 14,000 people in around twenty establishments, mostly situated in the suburbs of Toulouse.

But the economic significance of this aeronautics sector goes far beyond the principal manufacturers. Thus in 2004, nearly 530 regional establishments were partners in this activity: industrial sub-contractors, suppliers, design offices and even service providers, notably for IT. All of these establishments employ over 31,000 people, more than half of whom are exclusively involved in aeronautical construction work.

At a more general level, statistics indicate that aeronautical and aerospace construction in 2000 had an estimated spill-over effect of 75,000 full-time jobs in the Midi Pyrénées, 67,000 of which were in Haute Garonne (INSEE, 2006).

However, the aeronautics industry is subject to highly specific constraints and threats, in spite of the current period of growth. The specific constraints in this industry relate to the characteristics of both the product and the market.

The aeroplane is first of all a product whose lifecycle is particularly long, in the order of 30 years, which requires aircraft manufacturers to define products adapted to the market and its evolutions over the same period, as well as guaranteeing the same service and safety levels throughout the operational lifetime of the plane (Alcouffe, 2001). It then requires significant recourse to subcontracting, estimated in the order of 70% for the A380 and over 80% for the A400M military transport plane, with probably a comparable level for the future A350. It also involves very high development costs with a point mort of approximately 10 years for launching production and therefore a sharing of these costs between the various partners.

The aeronautics market in turn has the twofold feature of being an oligopolistic market subject to exacerbated competition between Airbus and Boeing, as well as significant economic and cyclical fluctuations which benefit one or other of the two manufacturers. Since 2004, this market has entered a new growth cycle with favourable development prospects over the coming years, even if they may face serious threats. For example, the aeronautics industry has to cope with the traditional stagnating or uncertain North American and European markets over the coming years and the booming Asian markets, which oblige it to make compromises such as the development of production lines in these countries to manufacture aircraft purchased by local airlines. Furthermore, even if the air transport industry is being restructured, global production capacity should remain in surplus in the aeronautics industry over the coming years. However, prospects for the sector in terms of jobs suggest there will be a continuing fall in its workforce over the next fifteen years, notably owing to constant productivity gains (Igalens, Passeron, 2001).

Given these factors – reorganisation of the aeronautics sector, the impact on employment and more widely on the local production system – this paper questions the strategy of the group of actors in the aeronautics industry through the example of the sector in the Midi Pyrénées: what changes are required in the contractor company – Airbus – and its sub-contractors? What are the adaptation strategies in these companies? What assistance should be provided to this sector by the public authorities?

PART 1 - CHANGES IN THE AERONAUTICS SECTOR

In 30 years, evolutions in Airbus's industrial approach have led to major changes in relations between the contractor and sub-contractors and a reorganisation of the sector in the Midi Pyrénées region.

1-1 THE CONTRACTOR'S STRATEGY

Until the end of the 1970s, the aeronautics industry was structured under the continued impetus of the State, which largely decided on the choice of products and the managers. This so-called "arsenal" logic (Dupuy, Gilly, 2004) led to an industrial and financial concentration process and the creation in 1969 of a single company – the SNIAS – which then undertook all the tasks relating to aircraft manufacturing.

Then, as from the mid-1970s until the end of the 1990s, analysts observed a decline in the State's role and the expansion of a competitive logic. This logic began with the creation of the economic interest group and its full commercial effect was seen in the A320 programme launched in 1982. The French State gradually withdrew, notably in terms of public subsidies, owing to the competition rules imposed by the European Community. Airbus then introduced a new strategy which was reflected by significant organisational and technological changes that were further amplified with the creation of Airbus SAS in 2001, which had notable consequences on the entire local aeronautics sector.

1-1-1 Fragmented industrial organisation

Airbus's organisation is structured around the establishment of an international division of labour by means of an industrial concept based on various Centres of Excellence, in accordance with the principal skills located at each site in its area of expertise. Each site – 16 in total – produces a complete section of an aircraft which is then transported to a final assembly site in order to build the complete aeroplane. The details vary according to the aircraft model, but the most frequent organisation is the manufacturing of wings in Great Britain, the tail in Spain, the fuselage in Germany and the nose and central section in France. The final assembly takes place in Toulouse or Hamburg. This division of the workload between the various production sites is combined with a division of labour between the various plants within a single site (4 in Toulouse) and a distribution of the work between Airbus and sub-contractors.

One of the major problems is therefore coordinating the design and manufacturing of sub-assemblies and coordinating the integration of sub-assemblies in the final product. These concerns led to the reorganisation of the structure and control of the aircraft division. Since 1987, the site-based organisation has been replaced by function-based organisation, in order to improve coordination between the industrial sites and harmonise production tools, with operational control based in Toulouse.

1-1-2 Outsourcing of secondary activities

The move to refocus on the core business of aircraft manufacturing was reflected by a significant increase in the outsourcing of activities considered to be non-strategic. Thus the integration of aircraft systems and sub-systems – which is considered to be central to the aircraft architecture and integration business – is not sub-contracted. Sub-contracting relates to sub-systems or sub-assemblies – major system components or aircraft parts.

This therefore signalled the end of the integrated firm model which had prevailed in the 1970s, when aircraft manufacturers undertook most operations for manufacturing aeroplanes in-

house. As such, the proportion of purchases in Aérospatiale's turnover increased from 40 to 70% between 1980 and 1990.

This outsourcing of secondary activities led to an increase in the number of sub-contractors, higher monitoring costs and difficulties in guaranteeing production quality, especially as each establishment managed its own purchasing and sub-contracting. These negatives consequences of decentralised management as well as the prospects for the development of new programmes forced Airbus to develop a proper policy in relation to outsourcing in the early 1990s. The objective for Aérospatiale was therefore twofold. It was first aimed at reducing the number of sub-contractors, from nearly 700 sub-contractors to approximately 120 first-level sub-contractors. Furthermore, with a view to seeking financial assistance for development owing to the State's disengagement, notably with regard to R&D, this involved selecting sub-contractors whose size guaranteed independent management and financial capacities which enabled the risks associated with the launching of major programmes to be shared.

This outsourcing was therefore based on the creation around the company of a stable network of partners with complementary activities in which long-term relations were established through contracts and partnership relations with the objectives of improving performance and sharing risks.

1-1-3 Generalisation of the organisational principles of competing engineering

These principles, introduced in the 1990s, involve taking into consideration the entire product life cycle, beginning with the aircraft design phase, from start to finish, including production, commercialisation, maintenance and recycling materials and components. This led to the association in the design process of all the actors whose expertise resulted in their involvement at various stages and in different aspects of the life cycle and getting them to work as simultaneously and concurrently as possible.

These principles had already been developed in the automobile sector but nevertheless posed problems in their application on a European scale, in a company such as Airbus with thousands of sub-contractors (taking into account the entire sub-contracting chain).

This so-called ACE "Airbus Concurrent Engineering" approach began in 1995 in order to shorten the development cycle by 30% and reduce production costs throughout the aircraft's lifetime. It was followed up in 1999 under the European "Enhanced Aeronautical Concurrent Engineering" programme in order to define new ways of working throughout the sector to improve its competitiveness through the development of methodological standards applicable throughout the supply chain.

1-1-4 A cost-reduction logic

This logic has generated a number of initiatives in various fields over recent years and has resulted in the introduction of a series of tools and action plans, including:

A- A rationalisation and internationalisation of procurement policy

The Group's purchasing – of systems and equipment, aerostructures, components, materials and services – each year account for approximately 70% of turnover and are therefore subject to great attention in a cost-reduction logic.

Thus in 2002, Airbus launched a "Sup@irWorld" tool (an abbreviation of "Suppliers and Airbus World") aimed at rationalising the company's multinational logistics chain between

Airbus and its suppliers, which took the form of a single Web platform for all suppliers. The supply chain management had previously been conducted through a network of numerous entities, various communication media and interfaces, and a range of order management processes. Now all of the information in the logistics chain for Airbus personnel and suppliers is centralised in a single place.

This platform covers the entire purchasing and procurement process and is intended to become the sole channel between Airbus and its suppliers. Generally speaking, this platform has made it possible to standardise and rationalise Airbus's purchasing process and make the logistics chain more secure. In 2006, some 800 suppliers had to be connected to this platform which managed for example all of the A380 systems.

Furthermore, the group is pursuing an internationalisation policy for procurement in order to achieve cost reductions as well as facilitating access to rapidly expanding markets (China) or to avoid potential customs' barriers (USA).

Thus the value of Airbus's purchases from China increased fourfold between 2000 and 2006 and will double again by around 2010. China should also contribute to 5% of the A350 programme as an industrial partner, sharing the programme risks.

Airbus is also envisaging opening an engineering centre in China which should employ around 200 people in around 2008. Airbus spends some 7 billion dollars per year in North America, i.e. 40% of its annual procurement budget. This represents approximately 140,000 North American jobs and makes Airbus the American aerospace industry's largest export customer.

B- Savings plans

Since 1995, the so-called CAP (Growth and adaptation through processes) horizontal progress procedures have been introduced and enabled costs to be reduced by nearly 30% in 4 years. They were followed by a "Route 06" programme, launched at the end of 2004 in which Airbus called for a reduction in its direct sub-contractors' prices in the order of 15% so as to be able to reduce costs by 1.5 bn euros per year as from 2006/2007 and thereby maintain competitiveness, increase productivity and cope with the weak American dollar. In September 05, a new plan was launched envisaging the achievement of an additional 1.5 bn of additional savings by 2010.

Over recent weeks, Airbus managers have indicated that the Route plan will not achieve its objectives as initially envisaged in 2006/2007. Various reasons have been put forward to explain this failure: unexpected cost of materials, extra costs generated by delays in the A380 (in the order of 2 bn) and those expected for the A350 (4 to 5 bn) as well as the unfavourable exchange rate effect for Europeans – a 42% appreciation of the euro compared with the dollar since the launch of the A380 programme. In order to deal with this situation, a further drastic savings plan is being prepared.

1-2 THE IMPACT ON THE SECTOR

All of these strategy changes at Airbus have been reflected through major modifications in the region's aeronautical sector.

1-2-1 A reorganisation of sub-contracting

This reorganisation notably results from modifications in aircraft design and the outsourcing of production and service activities which are considered to be non-strategic.

Thus, at the end of a so-called “systemic rationalisation” process (Frigant et al. 2006), a plane can be broken down into technically homogenous sub-assemblies or assemblies. A single company is therefore entrusted with the entire study, development, industrialisation and manufacturing phases for a major component in the aircraft.

Airbus’s sub-contracting network was described (Kechidi, 2006) as a hierarchical pyramid organised on four levels:

- **The aircraft system engineers or module integrators** cover all the businesses which take part in the design and production of technical sub-assembly for which they are responsible. The system engineer shares the financial risk with the aircraft manufacturer by contributing to R&D expenses and industrialisation costs;
- **Equipment manufacturers** supply either the individual technical modules or modules which form part of a more complex technical sub-assembly;
- **Specialist level 2 or 3 sub-contractors** are generally mechanics firms or IT service providers;
- **Capacity or production sub-contractors** mainly include small firms which supply broadly standard production parts or services in highly competitive markets.

Furthermore, the outsourcing of secondary activities has had major consequences by reducing and creating a hierarchy of sub-contractors. Thus the number of sub-contractors in direct relation with contractors has been reduced from 690 at the end of the 1980s to around a hundred nowadays. An increase in their average size can also be observed as the proportion of companies with over 100 employees has increased from 54 to 69% for all of the related establishments.

Airbus’s main partners are currently level-1 system engineers and equipment manufacturers which pilot the sub-contracting cascade and whose strategies have structuring effects on the rest of the suppliers at lower-levels of the organisation pyramid.

1-2-2 New contractor/ sub-contractor relations

A – Partnership links

In a few years, Airbus has developed a genuine network of partner sub-contractors who share risks with Airbus in the development of new programmes within the regional fabric of some 530 SMEs and SMIs involved in the aeronautics sector.

The partnership is particularly strong between Airbus and the level-1 sub-contractors. This is the case for the general aircraft design and research and development phases, during which for example teams of engineers and technicians are seconded to Airbus. This pooling method of working was developed in particular during recent programmes including the A380. It refers to the practice of bringing together people from various Airbus’s sites and departments and from its major partner firms in the research office, in the development of a design for whatever part of the programme, to finalise the various preparation and execution phases of the programme. These integrated teams include 5 to 10 engineers for each sub-contractor over a variable period of 6 to 18 months or even 2 years. Furthermore, the contractor is concerned about its sub-contractors’ performance and signs development agreements with them in terms of costs, quality, lead time and reactivity.

This partnership has advantages for all the parties. It gives the contractor the possibility to maintain greater control over production whilst outsourcing it, reducing design time through the

association of the sub-contractor in the early stages and even obtaining greater reactivity from them than they could have achieved internally.

Apart from the fact that they are bound to this type of integration in order to maintain a level-1 supplier position, these partnership relations should enable sub-contractors to enhance and make the most of their knowledge and know-how by using the contractor's resources, as well as to obtain a guaranteed workload over a period of several years.

All the same, certain sub-contractors consider that these working relations most often remain relations between a strong and a weak party, notably when the economic climate becomes difficult, in which case the balance of power has a natural tendency to re-establish itself through additional pressure on costs or a sudden increase in the volume of demand with very short lead times.

Finally in terms of other sub-contracting relations than those between the contractor and major partners, it is clear that such a partnership remains limited. INSEE statistics thus indicate that 45% of the establishments in the Midi Pyrénées are confined to a sub-contracting role for production and only 15% obtain a contract for several years. The characteristics of these SMEs – with limited workforces, minimal financial standing and not very widespread certification – suggests that they will have difficulty positioning themselves in any other way than as production sub-contractors, except perhaps if they develop cooperation agreements.

B – Commercial relations

Market logic now currently prevails in relations between the contractor and sub-contractors, which has led to changes in the nature and object of these relations. It is no longer a matter of purely technical relations. They are above all commercial (the determining factors being the price and production terms) with a pre-eminent role for the purchasing department which now has strategic significance. Neither are inter-personal relations any longer about agreements between company managers, often longstanding and based on trust, but have become depersonalised, formal relations.

This “contractisation” of relations (Kechidi, 2006) is reflected by an increase in contracting procedures and greater formalisation of invitations to tender. An invitation to tender in the sector contains some 1,000 pages and the drafting of a response requires all of the company's energies and can involve a team of between 5 and 30 people for many weeks. The evaluation of responses is carried out by two independent committees – one technical, the other commercial – which then make way for the final negotiations that can go on for several months or even years. These tendencies should increase with the internationalisation of contractors' purchasing policies, which present establishments with further competition in their own market. This obliges them to revise their own policy and assign greater importance to access to information and certification as a major competitive advantage.

C – Sharing risks

The strategy of sharing risks with the main suppliers has become a strategic element in Airbus's policy in a logic to improve performance and competitiveness.

There are four major risks (Frigant et al. 2006). Firstly there is the exchange risk, which is particularly important for Airbus, which conducts two-thirds of its turnover in dollars and is thereby seeking to increase the proportion of its purchases in dollars – which currently stand at around 40%. There is then a manufacturing risk, in that the product has to be made in accordance with the technical commitments and within the deadlines. There is also a commercial risk, with

an ever-present possibility that the market will momentarily or sustainably decline. Then finally there is the customer risk, related to the solvency of the customer at the time of delivery.

The sharing of risks with the major partners takes several forms which all have major implications for the sub-contractors.

Level-1 sub-contractors first of all contribute to the financing of development expenses by taking charge of “non-recurrent costs” which are amortised over the number of aeroplanes sold. These “non-recurrent costs” represent the cost of tangible or intangible investments related to the design and development of products. Thus the total coverage of non-recurrent costs corresponds generally to 600 aircraft in the Airbus A330 and A340 programme. If Airbus sells less than 600 aeroplanes, the sub-contractor will only recover a part of its investment. The break-even point is now lower according to analysts, in the order of 300 planes for the A380.

Then the contracts which bind contractors and their partners are all-inclusive contracts. The parties are committed to a contractually negotiated price which is valid for the entire lifetime of the equipment. If the price of the system turns out to be higher than agreed, the supplier has to assume the financial consequences.

PART 2 - ADAPTATION STRATEGIES IN THE SECTOR

The companies in the sector – both aeronautical constructors and all of their sub-contractors – have been obliged to set in place strategies to adapt to environmental constraints and changes in the sector. In a context of globalisation of markets and increased competition, the aim is to simultaneously deal with numerous demands for cost reduction and competitiveness, reactivity and flexibility, overall supply capacity and risk-sharing as well as implementing new technologies and expertise.

The most frequently observed strategies in the sector cover four principal objectives: anticipation, adjustment to the workload, passing on the financial risk to the lower sub-contracting levels and industrial reorganisation.

2- 1 ANTICIPATION STRATEGIES

Anticipating change takes on different forms in companies in the aeronautics sector. In establishments surveyed in the Midi Pyrénées, it is essentially reflected in diversification policies, monitoring activity and reflection on strategic activities.

2-1-1 Diversification policies

Aeronautics companies undertake market diversification procedures in order to achieve the two objectives of defence against the cyclical nature of the activity as well as reducing their dependence and therefore their vulnerability with regard to the sector.

It involves countering particularly long and sudden economic cycles in this activity sector. For example, over recent years, after a crisis phase in the 1990s, activity in the aeronautics sector has been recovering since 1998. Then it fell again in 2002 and has finally recovered its dynamism with the simultaneous launch of major projects including the A 380.

It also involves preventing or limiting a certain vulnerability in firms by reducing their dependence on the sector. The level of dependence of sub-contractor firms with regard to aeronautics is quite high: in 2004, INSEE noted that 54% establishments who responded to their survey on aeronautical sub-contracting generate over 80% of their turnover in this sector. Their dependency is even greater for the 20% of establishments whose aeronautical activity accounts

for 90% of their turnover, which reveals the concentration of this sub-contracting on a limited number of large firms.

The many and varied diversification policies may relate to markets, customers or the activity sector.

Thus the EADS group has had the strategic objective for a number of years of rebalancing civil and military activities in order to reduce the impact of civil aviation cycles through the development of defence activities, which is a stable growth industry. This rebalancing has been successful as the turnover generated by defence activities increased by over 50% between 2000 and 2004.

Another example is the firm Latécoère in Toulouse, which specialises in aeronautical cabling and the manufacture of sections of fuselage, employing 1,900 people. Although Airbus still accounts for 49% of its activity, the company is attempting to diversify and seek new customers. The Group is positioned in all the segments of the aeronautics industry and its customers include Airbus and Boeing – passenger doors of the future 787 – for commercial aircraft, Embraer and Bombardier for regional aeroplanes, along with Dassault Aviation for business jets and military aircraft. Latécoère conducts its activities internationally and is now established in Poland, Tunisia, the Czech Republic, Brazil and the United States.

A final example of diversification is that of the firm Liebherr Aerospace in Toulouse, which specialises in the complete air processing system for aircraft, including air conditioning, pressurisation and heating. On the Liebherr Group scale, the diversification of its activities is wide-scale, with a strong presence in the public works sector, aeronautics and domestic appliances. The industrial unit in Toulouse has also diversified its customers and markets. Thus last July, it signed a Memorandum of Agreement with Boeing for the supply of both the air sampling and air conditioning system for the American manufacturer's new long haul aircraft, which is a major breakthrough in the American market and the largest contract it has won directly from the American company.

The system will be developed and manufactured mainly at the site in Toulouse, with the creation of a permanent office in Seattle. Furthermore, the company is exploring other activity sectors. This is the case with the rail sector and has been envisaged for around a decade under the impetus of the group, which has received several industrial contracts which are minor in terms of workload, but whose prospects would appear promising in the long term. It is also the case with the automobile sector, which is organising a small group of around ten engineers for new projects.

2-1-2 Monitoring activity

Research offices are highly active in the early stages of aeronautical projects and undertake important monitoring work as part of their overall reflection on the company's strategic activities.

At LiebherrAT, for example, air supply technologies in aeroplanes are going to change radically and the core business is going to evolve massively over the next 10 years. This ongoing obligation to innovate implies the participation and even leadership of European research groups. This is the case with a working group which is looking into air treatment systems in aeroplanes, which brings together some thirty European industrial actors, for which LiebherrAT coordinates the work. Furthermore, the company is launching into the development of new products such as an air conditioning system for kitchens on board aeroplanes. Major changes in standards are going to take place with regard to the storage of food on aeroplanes, which will involve an extensive market, as all the aeroplanes will have to be changed.

2- 2 WORKLOAD ADJUSTMENT STRATEGIES

Employment is considered to be a preferred means of adjustment in the aeronautics sector and has been used for many years to manage fluctuations in activity, often through a transfer of workload variations throughout the entire sub-contracting chain.

The most striking example of this is at Boeing, whose “Hire and Fire” policy led to the cutting of 30,000 jobs immediately after the 2001 attacks.

However, such employment policies generate a major risk of a loss of skills, of which companies are now perfectly aware and against which they are trying to defend themselves. They then adopt strategies aimed at equipping themselves with so-called “reactivity” capacities (CEREQ, 2003), which bring about a certain stabilisation in jobs.

Thus the significant reductions in activity in the 1990s and in 2001 lead to workforce reduction measures both among contractors and sub-contractors.

As an example, Airbus France introduced early-retirement measures from the age of 57 on a voluntary basis, redundancy agreements, part-time working measures and financial compensation for hours cut, as well as the possibility to transform a full-time job into a part-time job for two years. Geographic mobility was also introduced through a practice consisting of transferring people from an over-staffed to an under-staffed plant, for a limited duration. The company also proposed to suspend the contract of certain employees for two years, after which these volunteers returned to their jobs.

In a partner company such as LiebherrAT, workforce management analysis over the past 25 years reveals that the company has used social plans during periods of low activity: one in 1992 and the other in 1994. The first enabled the workforce to be reduced by approximately 10% through measures according to age -80FNE- whereas the second plan operated on a broader scale – one quarter of the workforce – and was more difficult and socially painful, with 67 straightforward redundancies. On the other hand, during the 2001 crisis, the company “instantly trimmed its sails” notably by stopping recruitments. The workforce decreased through natural erosion by 5% with several voluntary departures and it was not necessary to adopt non-institutionalised, age-related measures as envisaged in the most pessimistic scenarios.

These practices clearly illustrate that in a down turn, companies seek to maintain existing jobs in order not to compromise their reactivity when the recovery appears. Airbus did not hesitate to present this prudent employment strategy internally and stressed the fact that in exchange, the company expected its employees “to achieve standards of excellence in their field of expertise, to develop their skills and support the company’s efforts in the event of a recession to cope with the cyclical aspect of their activity...”

Aeronautics companies have become aware of the need to preserve their key resources during these periods of reduced activity otherwise they risk not being able to find them when activity resumes (the “Boeing” syndrome).

Certain functions in the aeronautics sector require varied and often longstanding experience: in order to become a specialist in the flight command system, you have to begin as a young engineer specialising in “structure” for 5 years, then work on other specialities for 10 years. This type of career is more difficult for HR to acknowledge than management or expert careers, as every 5 years, the engineer follows a new path to become a specialist.

In this way, a company such as Airbus can clearly identify strategic populations and develop strategies to retain them. A typology of these strategic specialisations was drawn up but only the broad definitions of this identification work were divulged. Of the 150 specialisations identified in the company, 12 are strategic and classified according to the two areas of technical expertise and horizontal expertise (risk management, resources management, change management, sub-contractors and suppliers management, etc.). Once these strategic skills have been identified, they are then located within each business unit. For each of these strategic skills, a person was designated to ensure that they remained in the company or were renewed where necessary.

Furthermore, a number of knowledge transfer strategies were introduced consisting for example of providing consultancy contracts to employees who retire (United Kingdom and Germany) or transforming in-house teams into sub-contractors (France).

The workload was also adjusted by repatriation practices which particularly affect sub-contractors during phases of economic downturn. But this subject is perceived to be highly sensitive as it systematically triggers strong political reactions at the local level, notably from prefects and the Chairmen of Regional Councils. Margins for manoeuvre are thus quite narrow insofar as the contractor does not necessarily have the production resources to deal with this repatriation.

Airbus therefore established the following forecasts for 2005:

- 48% of outsourced production could not be repatriated in the event of an economic downturn, and the company would suffer the full effect of the recession;
- 29% of this production is likely to be repatriated subject to the availability of equipment, as it involves “heavy” sub-contracting requiring specific investments;
- 16% of parts can be repatriated as Airbus has the requisite production capacities;
- 7% of sheet-metal and mechanical operations can also be repatriated.

2- 3 RISK DEFERRAL STRATEGY

Major partners had a “risk sharing” strategy imposed on them by their contractor in a bid to improve performance and transferred their requirements to their own sub-contractors. Thus the major partners in many respects have comparable relations with their sub-contractors as they have with their contractor.

The recourse to such cascade sub-contracting is important as the INSEE 2005 survey indicates that 40% of related establishments in turn make use of sub-contractors, and this was above all conducted by the largest establishments. However, the importance of this recourse to 2nd and 3rd level sub-contracting is variable, and is often more widespread in production firms. Thus LiebherrAT entrusts 60% of its turnover to sub-contracting, Latecoère 50% and Thales 30%. This sub-contracting is sometimes of foreign origin, taking place in countries with low labour costs, where 100% subsidiaries are established, or involving contractual relations with local actors.

This transfer of risk down the sub-contracting chain takes the form of a policy aimed at rationalising sub-contracting – once again in order to select and reduce the number of suppliers – and to establish long-term relations with partners in exchange for their acceptance of a lower price.

LiebherrAT's practice in this respect is significant. This company selects its suppliers based on two criteria: their capacity to accept risk and the fact of having a suitable structure in terms of scheduling and planning work. LiebherrAT is concerned to improve its suppliers' efficiency which is assessed in terms of "punctuality of deliveries", an essential concept for a company whose activities – their main activity – is to integrate numerous components and sub-assemblies purchased externally. LiebherrAT is also concerned to generate loyalty among its suppliers in order to establish long-term relations and to include them at as early a stage as possible in studies so that they can contribute their own know-how in the definition of equipment and components.

Based on these criteria, LiebherrAT has selected its suppliers, which has resulted in a significant reduction in their number over recent years. An overall improvement in their performances has also been noted in terms of punctuality of deliveries. Certain suppliers which are systematically considered to be unsatisfactory have been obliged to adopt action plans in order to reach a certain level of service, otherwise they risk jeopardising their relations.

In exchange for these requirements, LiebherrAT undertakes to maintain or even develop a line of activity with its suppliers. During the period of a decline in activity in 2001, the company effectively preserved a certain level of activity instead of repatriating the work for parts for which it had sufficient production capacity.

2- 4 INDUSTRIAL REORGANISATION STRATEGIES

Industrial reorganisation strategies identified in the companies surveyed mainly reveal two different approaches: either they consist of changes in the industrial procedure and in processes, or they lead to choices in terms of the location of production.

The reorganisation of the industrial procedure can take many forms: changes in the organisation of production, the integration of new working methods or the integration of new technologies.

Thus a reorganisation of production by product line – previously trades – is a strategy used by a number of equipment manufacturers and system engineers in order to shorten production cycles and take advantage of the greater flexibility in terms of lead time. This is the choice made by two equipment manufacturers in Toulouse. Latecoère undertook such a reorganisation by separating the fuselage activity from the doors activity, with separate research offices and production areas. LiebherrAT did the same in its business strategy aimed at maintaining control over the most critical groups of products or ones which require more advanced technologies, and organised its production by product groups. As a result, the company has two production sites – Campsas and Toulouse – each specialising in specific product groups.

Furthermore, for several years, aircraft as well as equipment manufacturers have been introducing methods which were directly inspired by the car industry in relation to improving the production train or modifying the assembly chain. Airbus has therefore implemented continuous improvement methods in all of its process, such as just-in-time production and direct deliveries by suppliers to the chain. The company has thus completely reengineered the A 320 chain in Toulouse and Hamburg. Operators' tasks have been redefined in order to optimise the assembly time, the upstream logistics chain has been reworked and now the operators working on the plane generate the flows, for example by calling for parts at the last moment. In so doing, Airbus has reduced the total production cycle for the A320 parts by 30%, bringing it down to six months, and is capable of assembling its A320s in four days as opposed to the previous eight days. Boeing

had successfully done likewise for the assembly of its single-colour planes, as production lead times have been reduced by half, from twenty-two to eleven days. Airbus would also like to take this process further to transfer production methods from the automobile sector and has mandated an engineering firm to develop an ambitious project which could be applied to the production of its future A 350 aircraft. Equipment manufacturers such as Latecoère have also introduced quality indicators typically used in the automobile sector, but Latecoère has adapted them to its specific requirements such as the respecting of lead times within one day, the zero-defect rate at entry into the chain and the number of returns and anomalies.

This transposition of methods from the automobile to the aeronautics sector also applies to human resources. In 2005, Airbus recruited executives and technicians from the automobile sector owing to their expertise in terms of regulating production as well as for their experience in designing structures and calculation which make it possible to work with new materials for example. Between 2000 and 2005, the Brazilian company Embraer also recruited engineers from General Motors and Volkswagen, both solidly established in Brazil. Equipment manufacturers in turn recruited expertise from the automobile sector. This was the case in Latécoère, which recruited several engineers from this sector in order to improve its logistical organisation, owing to their particularly strong quality culture. LiebherrAT did likewise but nevertheless expressed reservations with regard to these recruitments. The Human Resources Department observed that unless these candidates were highly motivated, the “graft” did not strike. These employees were often uncomfortable with the small scale of the company compared with their company of origin and were very soon “drawn away” by Airbus.

Finally, in the same way as the major industrial groups, SMEs from the aeronautics sector were forced to include e-business in their strategy, as the use of Internet technologies was considered to be essential to reinforce the effectiveness of relations between contractors and sub-contractors. An “epme” programme was launched in 2003 for this purpose with the support of professional organisations in order to prepare sub-contractor SMEs to implement contractors’ e-business projects and to assist them in the field in the operational implementation of their e-business. There was a risk that the SMEs-SMIs which did not adapt their organisation to these new working methods would be automatically excluded from markets. Some 300 companies benefited from a diagnosis and proposals for customised upgrades.

An industrial reorganisation strategy can lead secondly to companies opting for relocation in order to reduce costs and develop production capacities.

Latecoère for example set up several production units abroad: two factories in Tunisia, a subsidiary in Brazil in order to be closer to its Brazilian customer Embraer which accounts for 23% of its turnover, as well as workshops in the Czech Republic (where a doubling of the surface area of the Prague site, whose workforce increased from 500 to 800 in 3 years, was made necessary for the manufacturing of doors for the A380).

In contrast to this relocation policy, others decide to invest in French factories. Thus LiebherrAT decided to “re-insource” production by acquiring a production unit in Tarn and Garonne. Such a policy is explained by the culture of the Liebherr Group, which only invests in safe countries, which are located close to its production sites. It is then justified by the company’s determination to expand its tooling capacities whereas in previous years, it had progressively outsourced its production and had begun to lose control over a certain number of essential parts. The objective was therefore to shift from a sub-contracting rate of 85% to around 70%. Thus LiebherrAT purchased one of its main sub-contractors, which was seeking a buyer.

The Liebherr Group has now announced that it is going to build a factory in Russia in early 2007 near the installations of its two Russian partner sites which manufacture aeronautical components, in order to win contracts with Airbus for the new A350 as well as to benefit from the development of BTP in the country.

PART 3 PUBLIC SECTOR INTERVENTION

In the Midi Pyrénées Region, the State and the Regional Council intervened to define a local economic policy to promote the aerospace industry. All of the actors and notably the DRIRE, a decentralised State department and the Midi-Pyrénées Regional Development Agency – Midi-Pyrénées Expansion – worked together to introduce a number of mechanisms to support the sector. This regional policy is particularly evident in two areas.

It is primarily a research and technological innovation policy which is particularly active in the aerospace sector in the context of State/Regional contracts for which, of the 6 targeted scientific areas, three are directly associated with the aerospace industry. This implication is reflected by support programmes for research laboratories and regional centres for innovation and technology transfer in order to promote technology transfers from laboratories to businesses and notably SMEs. The Midi Pyrénées region is also operating with CNRT Aéronautique et Espace, an essential actor in relations between science and industry. The region also supports research for the aerospace industry using its own resources and various methods, be it funding research in the call for CCRDT projects (1/4 of the areas supported in this context involve aerospace) and support for ONERA so that it can undertake new research programmes, as well as for businesses.

The determination to compensate for the structural and economic fragility of sub-contractors faced with industrial change in the sector and the cyclical nature of aeronautical activity guided public sector action in 2000-2005. These objectives notably led to the introduction of an interesting joint approach in the Midi Pyrénées region, which we shall focus on by analysing the tools, actions and where possible the expected results in terms of structuring the sector.

3-1 SECTORAL ASSISTANCE TOOLS

In December 2000, the State, working closely with the Regional Council and institutional partners under the impetus of the DRIRE, defined an action plan for the Development of Regional sub-contracting firms called the “ADER1 Plan” which was followed in 2006 by an ADER 2 Plan, as part of the Aeronautics, Space and On-Board Systems (AESE) Centre for Competitiveness.

3-1-1 – The ADER 1 Plan

The objectives of this action plan were to consolidate the regional fabric of sub-contractor SMEs in the aeronautics sector and assist SMEs/SMIs in their industrial change strategy, in a context of the renewed cyclical fall in production at the end of 2001, tighter requirements from contractors in terms of quality and lead times and increased competition between all the actors to maintain their market shares. The challenges facing the companies were even more significant in that they were attempting to access new programmes and had to be prepared to start up a new production cycle.

The ADER 1 Plan resulted from a multipartite approach mobilising all the regional economic development actors – State departments (DRIRE, DRTEFP, DDTEPF, Rectorat, DRRT, DRCE, etc.), the Regional Council, the Regional and Departmental Chambers of Commerce and Industry, regional and departmental economic development agencies, local production systems (Mécanic Vallée, Métal Adour), and even companies and professional organisations (UIMM, etc.).

The areas of intervention covered by the plan focused on several priorities:

- Intensifying sub-contractor SMEs' appropriation of concurrent, simultaneous engineering technology in order to accelerate their industrial change;
- To promote the grouping of sub-contractor SMEs in order for them to be able to propose a broader range of services and technological offers, as well as giving them greater financial capacities;
- Improving sub-contractor SMEs' competitiveness by inciting them to invest in production tools in order to increase their flexibility and encouraging them to make use of external consultancy;
- Facilitating the establishment of new companies to enlarge the region's industrial potential in terms of new expertise, whilst respecting a regional balance;
- Assisting the recruitment of new expertise through training, mobilising and uniting the various actors with regard to human resources;

This initial ADER Plan funded over 1,000 actions which benefited 429 firms from the regional network of sub-contractor SMEs, accounting for €23 m over the 2001-2004 period.

3-1-2 – The ADER II Plan and the “Aeronautics, Space and Onboard Systems” centre for competitiveness

Based on the achievements of the first plan, the ADER partners pursued this innovative assistance providing sectoral support to SMEs with the Ader II Plan.

This formed part of the “Aeronautics, space and on-board systems” Centre for Competitiveness in which it constituted one of the 12 major projects. This Centre accounts for 94,000 industrial jobs, including 50,000 in sub-contracting and over 1,200 establishments in the two regions of Midi-Pyrénées and Aquitaine. A single governance structure was established through the Aerospace Valley association, supported by all the industrial actors (major groups and SMIs) in partnership with research laboratories and organisations and training centres, assisted by public authorities and socioeconomic partners.

The areas of priority chosen for the ADER 2 Plan were based on new objectives including:

- facilitating and consolidating the emergence of level-1 intermediary companies, by creating the conditions required to reinforce their financial resources;
- developing level-2 sub-contracting networks around level-1 companies;
- anticipating the short and medium-term requirements of human resources and new skills, by assisting the establishment of truly prospective management of jobs and expertise and by contributing to young people's appreciation of trades;

At the end of 2005, the first year in which the ADER 2 Plan was implemented, the State and the Midi-Pyrénées region paid out €6 m, 1/3 of which was allocated to joint actions and 2/3 to individual aid.

3-2 STRUCTURING ACTIONS FOR THE SECTOR

The ADER 1 and 2 Plans, which have been undertaken for 5 years to assist the aeronautical sub-contractors network, take the form of actions which should structure the sector, even if for many of them it is too soon to judge whether this result will be achieved.

3-2-1 Innovative financial support mechanisms

Mechanisms have been introduced to help firms in the region to finance non-recurrent costs which they have to sustain in the development of new aeronautical programmes.

Thus an innovative programme of repayable advances has been introduced to cover 33% of non-recurrent costs. Furthermore, a guarantee fund managed by the BDPME supported by European FEDER funding has made it possible to guarantee 70% of the bank loans covered by the BDPME to finance 33% of the non-recurrent costs sustained by SMIs.

Another action is also currently operating with the banks to encourage them to back the final third of non-recurrent costs with minimal guarantees, given the public sector's effort for two-thirds of these costs.

These mechanisms are intended to jointly fund and limit the industrial and commercial risks sustained by firms in the region which take part in joint development, in the context of shared-risk contracts.

3-2-2 Actions to anticipate companies' human resources and new skill requirements

Various actions have been introduced to address the new needs in the sector's businesses with regard to a future expansion in the production cycle envisaged in 2004:

- *Publication of a "Training / Recruitment" handbook* for VSE-SME in the aeronautics sector which describes the most commonly encountered problems for firms in terms of human resources and proposes solutions (via partners' websites);
- *Financing training* for jobseekers in specific metalworking and aeronautics trades – 125 trainees – development of employees' skills – 161 in 10 companies;
- *Constitution of a GPEC tool* in cooperation with the UIMM to assist SMEs/SMIs to anticipate their skills' requirements and recruit personnel - 74 companies involved;

3-2-3 A sectoral economic and technological monitoring tool

An "AEROMIP" platform has been created in order to provide local aeronautical firms with useful information for their strategic reflections and decision making, by placing a database of verified information resources at their disposal and by proposing services for working in cooperation within a sub-contractors' network. Implemented in 2004, this platform had over 120 accredited industrial users by the end of 2005, including around a hundred regional SMEs.

3-2-4 Support for the appropriation of key technologies in the aeronautical sector

The objective is for example to promote the integration of composites technologies among sub-contractor companies in the Midi Pyrénées as these composite materials are replacing

lightweight metal alloys and are becoming increasingly widespread in the design and manufacture of aeronautical parts. Joint action supported by the UIMM should assist 30 SMEs to set up such programmes.

3-2-5 Assistance for improving sub-contractors' performance

Actions are undertaken to intensify the appropriation of “concurrent, simultaneous engineering” and extended enterprise practices by sub-contractor SMEs: creation of an aeronautical ISEE “Ingénierie Simultanée Entreprise Etendue” reference systems – benefiting 178 companies – customised diagnosis to help SMEs position themselves in relation to these reference systems – 50 firms – and individual assistance with the integration and rollout of this technology – 10 beneficiaries.

Other actions aimed more specifically at enhancing competitiveness have benefited 52 firms in the form of individual assistance: a diagnosis to enable the manager to analyse the firm's strengths and weaknesses and identify lines of orientation followed by assistance in the implementation of progress plans.

Finally, assistance in grouping together firms is currently in progress. The emergence of groups is being presented as an opportunity for companies to propose global offerings whilst reducing risks, but it is also a way of guaranteeing the long-term future of the regional sub-contracting network. Regional assistance involves raising awareness among managers – 53 managers – and assistance in the creation of groups. Five groups have been finalised. By way of an example, the “Eole 381” group composed of 17 firms from Tarn specialising in tools for the aeronautical sector have just been appointed “first-level sub-contractor” by Airbus.

A total of around 400 firms have benefited from actions under the ADER 1 and 2 plans, worth around €30 m. If their effectiveness is clearly difficult to determine, as some of them are very recent, their implementation bears witness to the importance of the issue in the aeronautics sector in the Midi Pyrénées region and the public sector's awareness of the need to assist regional sub-contractor SME-SMIs. Expectations are high: guaranteeing the long-term future and development of the local fabric and consolidating the leader position of the Midi Pyrénées in the sector.

This intervention by the public sector may however appear trivial given the current situation and the severe crisis affecting Airbus over recent months: after increasing its share from 20 to 50% of the world market and maintaining its leader position for five years in terms of sales, Airbus will have to surrender its position in 2006 to its rival Boeing.

The reasons for this situation are many and varied: delays in the delivery of the A380, the obligation to significantly revise the future A 350 – and its consequences on results, added to which is the cost of restructuring Sogerma – a 26% fall in the share price, management credibility placed in an awkward position by its executive management's sale of stock-options, worth several million euros, before the fall in the share price and a strategy director implicated in the Clearstream affair, shifting share ownership – the transfer by Lagardère and the Dailierchrysler Group of part of their shares – 7.5% – and the intention of British Aerospace to sell its 20% stake, the arrival of a Russian bank, taking a 5% stake in its capital, etc.

Faced with this crisis simultaneously involving its management, capital and industry, an internal inquiry into the company's dysfunction in terms of its industrial organisation and reporting is under way. The conclusions are expected at the end of September and should result in

decisions, under the impetus of a new management team led by Christian Streiff and a new A380 manager, Mario Hainen.

Clearly Airbus will have to undergo extensive reorganisation to improve its competitiveness and notably reduce by 40% the time taken between the design and production of its new programmes. The future industrial plan should be combined with a drastic savings plan but even now, it has been decided to freeze recruitment worldwide, in spite of plans to recruit 1,250 people at the German sites to cope with the increased workload, after recruiting 1,350 people in France.

However, Boeing is also having difficulties: probable delays in the delivery of its leading programme – the 787 – its obligation to speed up production from 7 to 10 aircraft per month, the need to build a second assembly line, etc. Competition between the two manufacturers, especially in the medium-haul market – 70% of sales between now and 2025 – will be particularly tough.

With the prospect looming of this strategic battle, Airbus will have to muster the commitment of all of its partners. However, relations between the European aircraft manufacturer and its suppliers are particularly strained, with the press widely reporting this situation – “it’s war between the manufacturer and its sub-contractors”¹ – confirmed by evidence collected during this study. Strong, mounting pressure on sub-contractors regarding prices, lead times and quality have contributed to the major unease generated by the aircraft manufacturer’s recent announcements – a further savings plan to be achieved by 2010. Other reasons also cited for the discontent among the manufacturer’s major partners include its aggressive tone², brutality in its statements – in contrast to the “fair attitude” of Dassault or “the greater humility” of Boeing. All of these considerations have to be taken into account in a context of savings and with an objective of industrial reorganisation.

¹ Usine nouvelle, “Dur, dur de fournir Airbus!”, 17th .November 2005.

² Le Figaro, “Toulouse, les sous traitants aussi en profitent”, 6th February 2006; L'express, “Airbus, La nébuleuse de Toulouse”, 25th May 06

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