



Overview of the Key European Aerospace Jet Engine Research and Development Markets

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Abstract: In this paper, I'm looking for the answer for the question, if for an oversee company, Europe market is attractive enough, should they penetrate this market. Triumph Group Inc. (Triumph) and one of their division Triumph Aerospace Systems Newport News (TASNN) are dealing with bespoke test rigs. This is a part of the Aviation, Research and Development (R&D), jet engines, test rigs. The paper presents the European aerospace and engine industry frameworks, the labour force and skills, the employment, the research and development and the engines. The paper deals only with the key player countries in Europe regarding engines. Based on Triumph numbers, the paper shows how much TASNN could gain if they would establish a company in Europe.

Keywords: Aviation, R&D, engines, Europe, USA

1 Introduction

The paper introduces the European Research and development engine market. The aim is to give a crude overview about the European Research and Development (R&D) engine market. TASNN settled in USA and the main business focuses are bespoke test rigs. This is a relatively small market segment in Aviation and R&D, as below.

1. Aviation
 - 1.1. Research and development
 - 1.1.1. Engines
 - 1.1.1.1. Jet Engines
 - 1.1.1.1.1. Test rigs
 - 1.1.1.1.1.1. Bespoke test rigs.

For TASNN it is essential to have an overview about the European market, to successfully plan the penetration to the market.

In the first chapter I introduce my research methods, and then I present an overview about the European market environmental characteristics, including, the aerospace industry frameworks, labour force and skills, employment, research and development and the engines.

In the second part I present market characteristics, the key player countries in the European market, Germany, France and the UK. In line with these data I make a calculation of how much market share could TASNN reach in the European market in 2014.

2 Research methods

In trying to gather hard market data for this project, I learned about some the challenges facing market researchers. Most of my contacts either did not have access to the specific data, or were unwilling to share this commercially sensitive information. Because I was not able to get the exact market data, I used the USA data for a starting point, and assumed that the European market is working in a similar way.

Fortunately numbers could also be found on the European Union's website, and ZAB ZukunftsAgentur Brandenburg GmbH (ZAB) also provided me local, state and regional level studies. These data are complemented with information that I could gather on conferences that I have attended, like InnoTesting 2013 and 2014, Wildau at 27/02/2013 and 28/02/2014. Young professionals in Aviation, Wildau, 06/06/2014, E-World, Essen, 14/02/2014.

3 Environmental characteristics

3.1 Regulatory environment

A mass amount of airplanes are produced for the global market. Because of the immense internationality of the business, rules for a fair trade and competition and entry rules are essential parts of the aircraft business framework. Several European papers and studies dealt with the industry's competitiveness and aeronautics. This involves more strategically issues as well as technological R&D projects. (FWC, 2009) They scale from technology R&D projects to more strategically issues and innovation. Two of these will be briefly presented: the Advisory Council for Aeronautics Research in Europe (ACARE) and the framework programmes. HORIZON 2020: "European Aeronautics: A Vision for 2020" the goals of which are to becoming a global leader in aeronautics while better serve society's needs. The last Framework Programme FP7 covered the period 2007 to 2013. (FWC, 2009) As the claim for professional engineers and technological people probably will grow on all levels in the service chain, the recruitment could be difficult. (FWC, 2009)

3.2 Economical

The aerospace industry is a capital and global intense business and the current and past financial crisis represents a major challenge. It hit both the claiming part of the aerospace sector (with airline companies and leasing companies) and the supply chain. This industry is highly dependent on high-tech engineering industry (availability of a flexible and high-skilled labour forces and skills.) Because of the ongoing demographic change the sector needs significant qualitative and quantitative employment planning. (FWC, 2009)

The European air transport system includes around 5000 aircrafts, which move around 1 billion people per year. 3.1 million people work in this sector, which represent 1.9% of all EU job possibilities. Around 500.000 people work in the European aerospace industry, the turnover of aerospace and defense activities in 2008 was EUR 104.7 billion. This means that the turnover per capita is EUR 209,000. This industry is highly concentrated in Europe, in EU27. France, UK and Germany accounted around 80% of the total European zone aerospace production and value-added and around the 70% of the total employment. (FWC, 2009)

3.3 Social circumstances

In 2008, 466,900 persons were working in the European Aerospace Industry. Compared this number with 2007, the increase is 5,6%. Nearly 85% of the direct employment in the European Aerospace industry is concentrated to five countries; UK, France, Germany, Italy and Spain. 90% of the employees are covered by these countries, plus the Netherlands and Poland. The major contribution to the 2008 rise in employment was France, Spain and Germany. Regarding the qualification of the employees 41% had Vocational school in 2008, this number is the same as is was in 2005. There is a small increase in who has university level education between 2005 and 2008. This number was in 2005 42% and in 2008 it was 44%. There are not so many people in this sector who have just general school (5%). Higher vocational school is 8,8%. With regard to the age distribution: People between 36-55 years are dominating the industry. Then the 26-35 years old people. With regard to the gender distribution: less than 15% of the workforce is female. (FWC, 2009)

One really important concern for the European Aerospace industry is the labour mobility. Cultural, linguistic and legal differences among the EU present challenges for the companies. Nowadays, because of the of the EU programs, the workflow is free within the EU as well as the student mobility. People within the EU are mobile and willing to move to another country. Aerospace is a multinational sector, which makes it important that EU industries grow together. This means bringing together multiple cultures, languages, traditions and making them work across the “borders”.

A qualified and skilled labour supply is crucial for the European aerospace industry and for its competitiveness and attractiveness. The education and training in the European area shows a high standard. The demographic change could be a threat; the Human Resources need to be planned really carefully. European industry sources change that availability of skilled technicians and workers has turned out as a core issue. Claim for

European aeronautical workers, who are highly professional is also growing at the lower parts of the business. Most of the concerns about skilled employment are at engineering. Technicians estimate that Europe's aeronautical business faces a shortage of around 25,000 workers per year. The attractiveness of this kind of studies is still not enough and not enough skilled and talented young people balance the demographic changes. Workforce mobility is not satisfactory in the European AI. Legal issues, cultural, and linguistic problems between European nations challenge companies create a need to shift workforce and processes between countries. It is necessary for high level training and education to coordinate multi nations and legal and governmental bodies and make them work across countries and cultures. Internationalization of production needs transparent and recognized training courses and graduations. It creates the demand for an internationally trained workforce and a better focus on language and cultural competencies. (FWC, 2009)

3.4 Technical background

Aeronautical manufacturers depend on the power unit of their machine on specialized engine producers. This gives airlines in multiply cases the right to select between two or more engine types, when they purchasing an aircraft. In one hand this is not only important for the competitiveness of the market, other hand also for the possible selection of missions. The oligopolistic market is dominated by three major manufacturers: Pratt & Whitney (P&W, a subsidiary of United Technologies Corporation , UTC, based in Hartford, Connecticut, USA), GE Aviation (a subsidiary of General Electric, based in Evendale, Ohio, USA), and Rolls-Royce (based in Derby, UK). Another important engine manufacturer is Snecma (part of SAFRAN and based in Courcouronnes, France). (FWC, 2009)

“For the large single aisle market, these companies have established two major joint ventures (primarily for risk sharing purpose): the “International Aero Engines” (IAE, Hartford, Connecticut, USA), who's partners are , JAEC (Japanese aero engine cooperation) and MTU Aero Engines (Munich, Germany); and the “CFM International” (CFMI, Paris, France), a 50/50 joint venture of GE Aircraft Engines and Snecma. CFMI is the world market leader in narrow body aircraft propulsion and produces the CFM56, which was for about 25 years the sole engine for the Boeing 737 family and also later for the Airbus A340-200/300. This quasi-monopolistic position gave rise to the formation of IAE in 1983, which powers with its V2500 engine the Airbus A320 family and McDonnell Douglas MD-90 aircraft. In 1996 General Electric and Pratt & Whitney formed in a 50/50 joint venture the “Engine Alliance” in order to develop, manufacture, sell and support a family of modern technology engines for new high-capacity, long-range aircraft”. (FWC, 2009)

“The main application for the corresponding engine GP7200 was originally the Boeing 747-500/600X projects, before these were cancelled owing to lack of demand from airlines. Instead, the engine has been re-optimized for use on the Airbus A380 and is therefore competing with the Rolls-Royce Trent 900, the launch engine for this aircraft. (FWC, 2009) Beside the large OEMs and the corresponding joint ventures (with a regional emphasis on the USA) there are several first and second tier suppliers in the global engine market - primarily in Europe: MTU Aero Engines in Germany, Volvo

Aero in Sweden, Avio S.p.A. in Italy, and ITP Engines in the UK [ITP is actually based in Spain and partly owned by RR], see Figure 3.36. Japan is also strong in this segment with the three parties of JAEC. The USA has only few component suppliers in the engine supply chain. (FWC, 2009) Rolls-Royce predicts a market volume for the engine market of almost USD 1,400 billion. (Including the aftermarket). MTU expects a similar volume (sales of new engines) over the next 20 years with more than USD 600 billion. Broken down into the respective categories this corresponds to wide body engines: USD 300 billion, narrow body: USD 220 billion and regional jet engines USD 100 billion". (FWC, 2009)

4 Market characteristics

Currently France has the highest production value; it lies behind the UK according to value-added employment share. A major reason for this difference can be attributed to the final assembly line of Airbus in Toulouse, where the major part of Airbus aircraft is finalized and delivered.

If I analyze the total employment by country, UK, France, Germany and Italy have the most people employed in the sector.

<i>Engines in Service and on Order, Respective Market Shares</i>				
<i>Data's in Million EURs.</i>				
<i>Manufacturer</i>	<i>In Service</i>	<i>Orders</i>	<i>Total</i>	<i>Market Share</i>
<i>CFM International</i>	<i>6,732</i>	<i>3,229</i>	<i>9,96</i>	<i>42.2%</i>
<i>General Electric</i>	<i>3,604</i>	<i>1,428</i>	<i>5,03</i>	<i>21.3%</i>
<i>Engine Alliance</i>	<i>4</i>	<i>78</i>	<i>82</i>	<i>0.3%</i>
<i>Pratt & Whitney</i>	<i>1,335</i>	<i>64</i>	<i>1,4</i>	<i>5.9%</i>
<i>IAE</i>	<i>1,53</i>	<i>975</i>	<i>2,51</i>	<i>10.6%</i>
<i>Rolls-Royce</i>	<i>4,416</i>	<i>1,068</i>	<i>3,48</i>	<i>14.8%</i>

Table 1

Engines in Service and on Order Respective Market Shares

Source: Based on FWC, April 2009, "Jet Engine Market Statistics", p. 56.

In the forthcoming paragraphs I am going to present the major countries/markets by region. After presenting their current status I tried to estimate whether their market opportunities are valuable enough for Triumph Aerospace Systems to enter the European market. I calculated how much Triumph Aerospace Systems – Newport News (TASNN) can penetrate the USA AI R&D market and then applied those numbers to the European market. For legal and commercial reasons, approximate (and historical only) Triumph revenue numbers were used.

4.1 Germany

There are a lot of core players in the German aerospace industry. Two examples for important OEM manufacturers located in Germany: Airbus Germany and Eurocopter. “There are also some potential Tier-1 suppliers, such as Premium Aerotech, Diehl and Liebherr Aerospace (in aircraft production), or MTU Aero Engines (in the engine market).” (FWC, 2009)

It shows that in the last years the strength of German companies in this area has strongly extended. Thus the German AI is characterized further on by many smaller enterprises, often family owned businesses. These companies are driven by their technological excellence in a particular small market niche and working on maintaining their business compliancy. (FWC, 2009)

Germany owns an excellent R&D infrastructure in multinational levels. The great joint actions are working well with universities, public and semi-public research bodies as well as testing a provider who provides a stimulating environment for growth in the aerospace sector. The existing infrastructure does not provide advantages for German companies only but also attractive for other nations players to utilize their opportunities of this excellent R&D environment. This R&D environment is perfect for German smaller enterprises in global competition to meet the challenges of the exploding global competition.

“German core competencies in manufacturing are primarily in the domains of fuselage, structures, and complex cabin equipment. It is of note that by M&A companies have improved their competency as system integrators. Furthermore, the German AI is strong in high-lift-systems, vertical tail manufacturing, and final assembly. A specific strength of technological driven German companies is identified in the areas of avionics and engines.” (FWC, 2009)

Germany has become the competence centre for Rolls-Royce for smaller engines. Cross processes such as flight-physics and aerodynamics are R&D focused and benefits a lot from the great German structure. A position of the country authorities is directed to support small and medium-sized enterprises (SME) in their scope to stay on the leading position in global market. Thus, the German legal bodies have a great focus on the Aerospace industry and know of their limit on other industries to keep up. As an outcome of many initiatives are taken by the Federal and the States’ government. There are a great amount of clusters initiatives which tries to develop regional positions and these can easily reached by local smaller enterprises. To lift up their efficiency the German Aerospace industry association, BDLI, plays a noteworthy role with its fora. (FWC, 2009)

The total sales in Germany in 2008 were 21,700,000,000 EUR. Germany spent 16% of this budget to R&D. I got that the R&D total is 3 billion EUR. TASNN can expect to win on average 0,15%, so it means that TASNN could have reached around 5 million EUR in 2008. The calculation is the same in the year 2011. Then I extrapolated those numbers to the future. With a simple calculation we assume that Germany total sale will be around 30 billion EUR in 2014. That means TASNN can win around 7 million EUR in the following year. Now the exchange rate is around 1.3 between EUR and USD, so it means around 9 million USD.

4.2 France

The French aerospace industry and government has always a joint vision on the need to maintain and increase the R&D funding budget, the industrial research capacity and the know-how transfer to keep an operational and independent Aerospace industry that has all the relevant key-technologies. Costs have been partly taken over by the French government and the industry has gained continued support which is involved in corporate governance of important key actors in the AI market. (FWC, 2009)

“France is an important manufacturer of engines for civil and military aircraft, fixed-wing aircraft and helicopters. CFM, a 50/50% joint venture of SNECMA and GE has excellent access to the US and the EU, by far biggest markets for engines.” (FWC, 2009)

All in all France shows a higher sales than Germany but the spend less for R&D. To use the same calculations TASNN could win EUR 6 million in 2008, but if we look at the future, it means that in France there are 10 million USD.

4.3 UK

“Like in many other Member States the AI of the United Kingdom underwent a phase of consolidation, but in the UK this had large consequences for its productivity. An enormous shake-out of staff took place and the economic performance improved significantly. (FWC, 2009)

Compared to the German and France players for labour affiance, attractiveness and labour costs the UK shows a greater numbers, but do not forget to take into account that for both other countries these actors are distorted by technical difficulties. Both country will improve as soon as these problems are solved. The UK used to be a global leader in the Aerospace industry. It is a leading supplier of aircraft propulsion, Carbon Fiber Kreations (CFK) applications for wings and leading of Air Traffic Management (ATM). However, the investigation in the business shows less attractive framework conditions numbers for R&D as for the German and French aerospace sectors. There is some sign that UK will lose its leading position of in the area of wings for Large Commercial Aircraft (LCA). A smaller and medium enterprise on lower levels of the supply chain faces growing competition from the new EU member states. (FWC, 2009)

Hence, UK has one of the biggest aerospace industries, but they do not spend as much to R&D as Germany or France. In 2008 TASNN could have closely 5 million EUR. But still if I look for 2014 this number is 6.5 million EUR, it means 8.5 million USD. It is

worth noting that since Rolls-Royce UK is already a customer of TASNN's, some of this market is already captured.

5 Summary

European market shows a great potential to TASNN, it would be worth to penetrate the market. Labour force and skills are key success factors for this high technology segment. Generally, the high level of the education and training in Europe shows a great standard. For research and technological development sector Framework Programmes were established to achieve the support and encourage research in the European Research Area and are the European Union. Regarding the revenue expectations European market shows all together around 28.5 billion USD. The European aerospace market is smaller than the USA (45% vs. 52% market share), but the Europeans spend more on research and development, so overall the market capacity is around the same. TASNN is already reaching some of the European capacity, but should they penetrate the European market more fully, they could significantly increase their business.

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