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CURRENT AERO-INDUSTRY BUSINESS MODELS

by

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Abstract:

This document presents a series of interpretations for the business models of the various actors within the aerospace value chain. The approach taken has been to use the Osterwalder approach for business model modelling discussed in the Month 27 deliverable (Olofsson and Farr, 2006).

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1. EXECUTIVE SUMMARY

From a broad perspective the aerospace manufacturing and service value chain covers airlines delivering value to the passenger through the provision of seats, through the airframer OEM, engine OEM and supply chains that cover both the provision of OE and the aftermarket spare parts and services. The aim of this report is to highlight and discuss some of the issues that exist within this value chain. In attempting this, the business model operated within each tier of the value chain is modelled and discussed, with specific reference made to how this may exert influence performance of the Aero-engine manufacturer.

2. INTRODUCTION

This deliverable forms part of a series of three deliverables which give understanding into what is a business model, and decision making aspects which need to be included when defining a business model (D2.1.2_1), how business models are applied in non-aerospace industries (D2.1.2_3) and this document, which examines and describes the business models evident within the aerospace industry.

The evolution of the aerospace industry is unique amongst other industry, insofar as competition has been significantly manipulated and controlled by domestic governments rather than being left to free market economics. International air travel has traditionally been a highly protected and regulated industry which has only recently started to transform into an open and competitive marketplace. Evidence of this is most obvious at the airline operator level, with the national *flag carrier* being an example, but protection is evident throughout the value chain and the effects of ongoing protection have significantly influenced the current strategies and business models in place.

This deliverable aims to describe some of this complexity. The focus of WP2.1 is the extended jet engine enterprise scenario, and this document examines each echelon of the extended enterprise and describes the structure of the relationship, the predominant business model adopted between companies, and how this may be influenced by future changes in the market place. Figure 1 is included to help understand the structure of this document.

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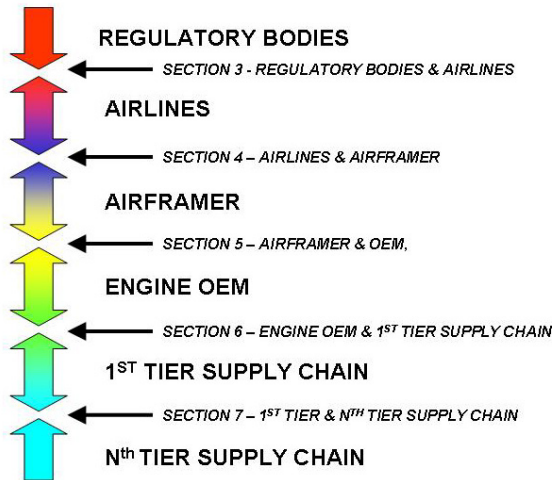


Figure 1. Document Structure

In describing business relationships it is important that a common understanding of a business model is in place. The business model concept is frequently associated with the dot com boom of the 90s, where companies exploited new technologies to find alternative methods to charge customers and earn on-going revenue. However, D2.1.2_1 demonstrated that the business model has far more complexity than the financial aspect, and can in fact, may be understood as the a description of how a business strategy will be translated into activities and operations (Olofsson & Farr, 2006). D2.1.2_1 highlighted the business model ontology by Osterwalder (2004) as a suitable method that could be used in building conceptual maps for business models. This subsequently allows for comparison and discussion. Shown in Figure 2, the ontology consists of 9 elements that are constituent parts of a business model. Mapping and describing key features of a company business model under each of these elements is the first stage in understanding and formalising the business model; if this can subsequently lead to increased understanding of how strategy is implemented, it could provide a basis for interpreting the effects of the likely evolution of the industry. Thus, this deliverable will use the ontology to compare and discuss business models within the aerospace industry.

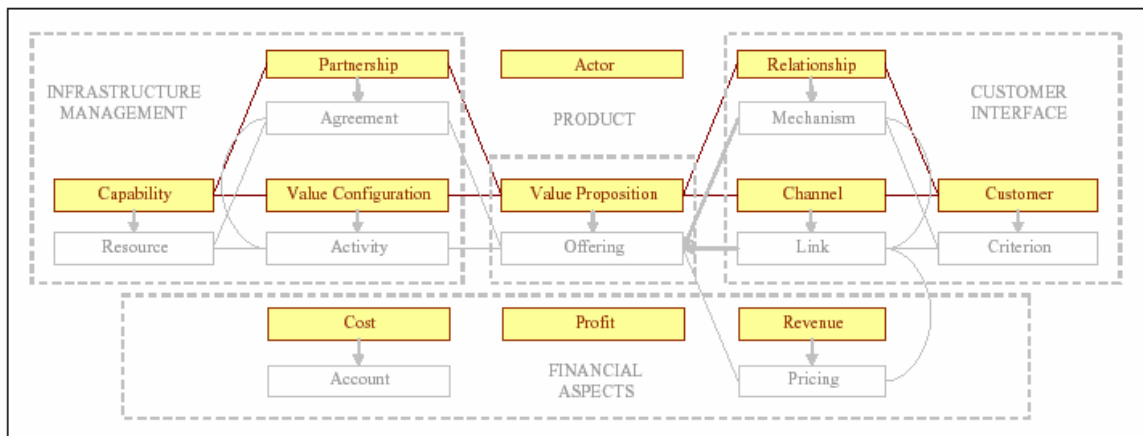


Figure 2 Business model ontology, the Osterwalder systems map of business model elements Osterwalder (2004).

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The definition of a business model given by Osterwalder (2004) is:

“...a conceptual tool that contains a set of elements and their relationships and allows expressing a company’s logic of earning money. It is a description of the value a company offers to one or several segments of customer and the architecture of the firm and its network of partners for creating, marketing and delivering this value and relationship capital in order to generate profitable and sustainable revenue streams.”

This definition is discussed in detail in D2.1.2_1 (Olofsson and Farr, 2006) but in principle this description, which has been adopted by the project team, provides a model for describing how a business commercialises a product leading to the generation of profitable revenue. This is the definition used within this document to discuss industry business models.

3. REGULATORY BODIES & AIRLINES

The aviation industry is significantly influence by regulatory bodies. These bodies exert power over and affect almost all aspects of the airline business model, and in turn, this is felt throughout the industry value chain.

As examples, regulators and government have influence over the following business areas:

Environmental regulation. Examples include emission quotas, carbon emissions and noise. Significantly, regulators (and ultimately the OEMs) often have to balance conflicting aims, for example achieving noise reduction leads to an increase in the CO2 emissions.

Taxation and financial regulation. As well as affecting the administrative requirements of the organisation, government regulation can affect the attitude towards investment, an example being rules towards asset value write down, this may lead to a predisposition for replacing kit. An example would be Singapore’s accounting rules allowing aircraft to be written off over 10 years so providing an environment where owning and trading assets can significantly improve an airlines financial position.

Company ownership & route deregulation. Privatisation and limits on subsidies have been a trend of the recent history of the European aviation industry (Gagnepain & Marin, 2006). This leads to efforts to improve efficiency and when combined with route deregulation increasing competitive pressures.

Company protection. Company protection laws include examples such as the US’ Chapter 11, which provides government protection from bankruptcy whilst a restructuring programme can be put in place. These affect the market by artificially preventing the natural balance of supply and demand. Where a failing company enters Chapter 11, the over-capacity which is likely to have led to this situation is not removed from the system and therefore continues the imbalance.

4. AIRLINES & AIRFRAMER

Doganis (2005) identifies three principle business models for Airlines:

the traditional airline business model;

the virtual airline; and

the aviation business group.

These distinctions are recognised by Rolls-Royce and therefore it is appropriate to use these as the framework in the following sections where each business model will be discussed in

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turn. Towards to end of this section, how the airline business model influences the Airline and engine OEM is discussed.

4.1. THE 'TRADITIONAL' AIRLINE

Using the Osterwalder ontology, the business model is described in Figure 3.

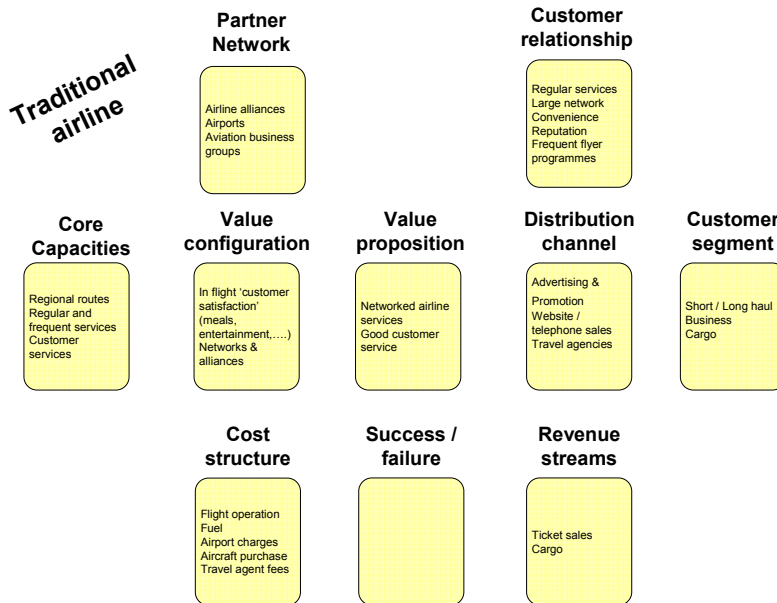


Figure 3. Traditional airline model.

Examples of airlines operating this business model include British Airways, Delta and Iberia.

The business model of a *traditional* airline has been heavily influenced by historical associations with national governments and is likely to have previously been a privatised national *flag carrier*. Customer value is generated through offering customer a regular scheduled service to major hubs which give access to through flights and access to a large network of routes. Flying on a traditional airline, the customer will have higher levels of customer expectation concerning the service they will receive, meals and in flight entertainment are minimums as well as taking responsibility for any delays or cancellations. All of this costs the airline money which must be generated by ticket sales revenue or through the carriage of cargo.

To operate the business model, the airline will have a large number of partnerships. Firstly, giving customers access to a large routes network through a single booking point can only be provided through alliances with other airlines. An example is the star alliance which has 18 airlines cooperating on code sharing, joint marketing etc., to ensure that the passenger can book a complex point to point journey through a single airline, even if this requires a number of legs on different alliance members. The alliances can also act to create a long-term relationship with the customer through frequent flyer programmes, where points can be accrued with each flight with any of the alliance members and passengers rewarded with free flights or perks such as access to airport lounges and discounts on car hire.

Historically, operationally, the business model is mainly self-contained, with little outsourcing of support services such as catering or maintenance, which will all be carried out by airline staff. However, more and more are now divesting themselves due to the successes of the virtual airline. This provides the economies of scale needed to provide an economically

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optimal solution, but can lead to risk through the necessity to deal effectively with contractor and partners which influence customer value. An example of where this did not work is the BA / Gate Gourmet crisis of 2005 where errors made in the contract management process significantly influence the passenger experience (Newall, 2006).

4.2. THE VIRTUAL AIRLINE

The virtual airline is the most popular for new airlines. This growth is significant and has been stimulated in Europe with increased deregulation of the market, and a rise of concepts such as ‘open skies’ which allows for greater competition on routes. Currently, there are approximately 50 budget airlines operating the virtual airline model, with the majority of these airlines being less than 10 years old (Rogers, 2004). The business model is shown in figure 4.

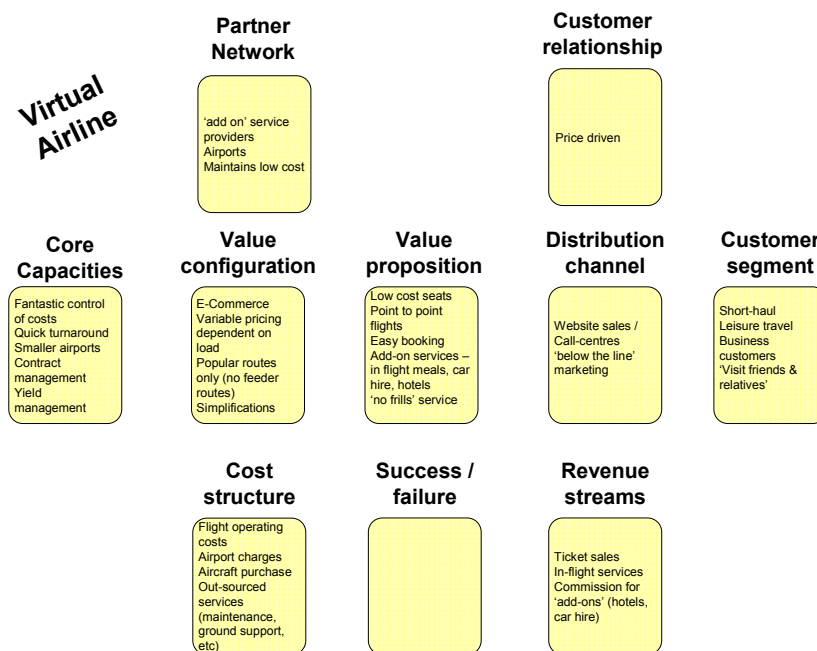


Figure 4. Low cost carrier business model.

The obvious examples of a virtual airline are Ryanair and Easyjet. As the name suggests the value proposition of the virtual airline model are the exceptional low prices available, with Ryanair suggesting that it may be able to offer flights for free in forthcoming years and revenue from other in flight services can offset the price of the ticket.

The exceptionally low flight cost is achieved through two main mechanisms, tight control of operating costs and the removal of ‘no-cost to customer’ frills associated with the traditional airline business model. Items such as in flight meals and drinks incur a cost on a Ryanair flight. virtual airline are very aware of their core capability, being operating the flight, ticket sales and attracting customer. As such, many support services handled internally by the traditional airline business model will be outsourced. This achieves three objectives:

High visibility of support service costs at the ‘market rate’. If a service provider is found to be expensive, then an alternative can be found;

Outsourcing allows these to be incurred as variable rather than fixed costs. This flexibility can then be used to closely follow peaks and troughs in demand;

The airline’s own costs are then clearly visible which aids aggressive management.

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As the value proposition does not include in-flight services, such as meals and in flight entertainment, then these become an additional source of revenue from the customer.

Outsourcing is adopted to ensure that costs are tightly controlled. Easyjet and Ryanair tend to use a tender process (perhaps as frequently as annually or bi-annually) to ensure good competition from the market place. By regularly reviewing pricing and service options and potentially changing supplier frequently means that partnerships and collaboration are difficult to establish through a evolutionary build-up of trust. As such virtual airlines must have excellent contract management teams to ensure that 3rd party contractors provide the support needed to build customer value. Effective partnership management, particularly in managing communication and interfaces is therefore required to ensure that all the companies involved work effectively together.

An area where partnerships are less important than for traditional airlines is in reaching the customer. The virtual airline sells direct through the internet or call centers, and only sells direct flights on their own routes. Therefore, the value proposition of the virtual airline differs from that of the traditional airline business model and as such, at least initially, the virtual airline appealed to a different set of the customers, increasing the total amount of passengers rather than pinching them from competition. However, with the boom in air travel, business travelers used the virtual airline option for leisure flights which has influenced the price expectation of customers (Doganis, 2005). Ultimately, this has eroded the market share of traditional airlines as customer began to realize that the better service is not worth the extra cash.

In the most recent downturn, this business model showed a level of robustness unusual for the cyclical aviation industry. Whilst traditional airlines struggled, particularly in the US, low-cost airlines such as EasyJet and Ryanair continued to show profit. This suggests that the greater flexibility built into the virtual airline model creates a more robust business; the virtual airline can adjust more rapidly to changes in the market place.

With the obvious success of the business model, Traditional *Flag carriers* have often sought to imitate the model with various levels of success. Examples include KLM & Buzz, and Air Canada & Zip. This has two benefits to the carrier, firstly the carrier is entering the low cost market, and therefore tapping into potential new sources of revenue, and secondly by transferring aircraft and staff to the *new* virtual airline operation, overcapacity and excess costs which may be caused, in part, through the success of the virtual airline, can also be transferred improving the finances of the traditional airline (Graf, 2005). However, problems are encountered when one business attempts to operate two mismatching business models. For example, the new working practices needed in order to be a successful virtual airline are difficult to apply to existing unionised employees.

4.3. AVIATION BUSINESS GROUPS

The final example for discussion is the aviation business group. An example of an airline operating this business model would be Lufthansa or Singapore Airlines. The business model is described using the Osterwalder ontology in figure 5.

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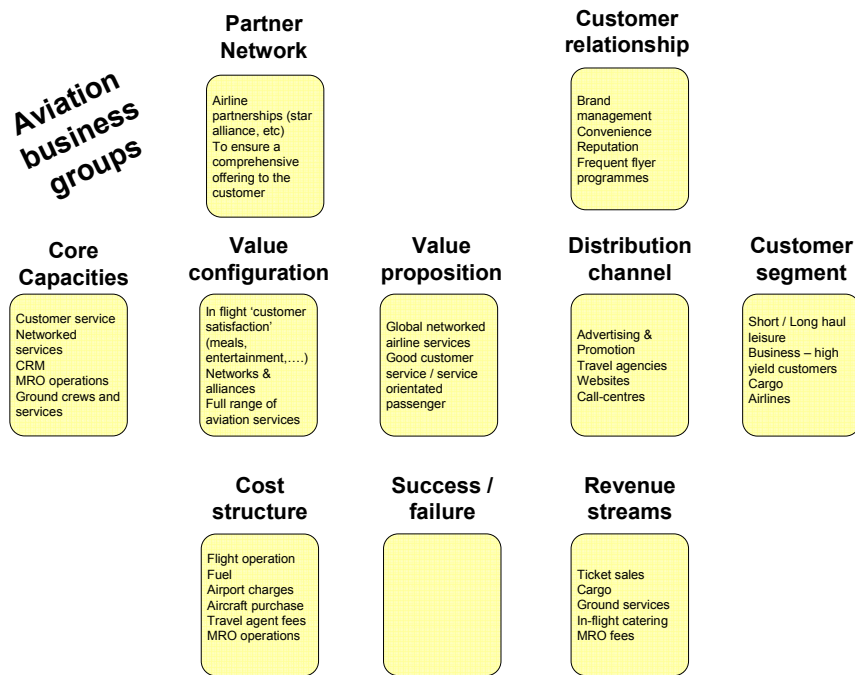


Figure 5. The business model of the aviation group business model

The aviation business group business model, from the customer perspective, may not appear significantly different to that of a traditional airline. Sales are through a combination of websales and travel agents, and these airlines still concentrate on the business traveller section of the market. However, the aviation business groups have broadened the range of industry services on offer to create additional sources of revenue. These business groups target other airlines as potential customer in addition to selling seats on flight and cargo space.

The opportunity to provide aviation services to other airlines has come about as a result of outsourcing, predominantly from airlines operating the virtual airline model. These business aviation groups can therefore use their own maintenance operating and ground crews for the support of other airlines, which allows this aspect of the airline operation to generate positive cash flow rather than being a cost in the traditional airline business model.

4.4. WHICH IS BEST?

It is difficult to rate the success of each business model, however, data provided by Rolls-Royce, collated from freely available resources, gives an interesting trend. Figure 6 compares financial performance with an indicator of the business model (the MRO index, a measure of MRO capability, the higher the MRO capability the more integrated the company and the lower the level of outsourcing).

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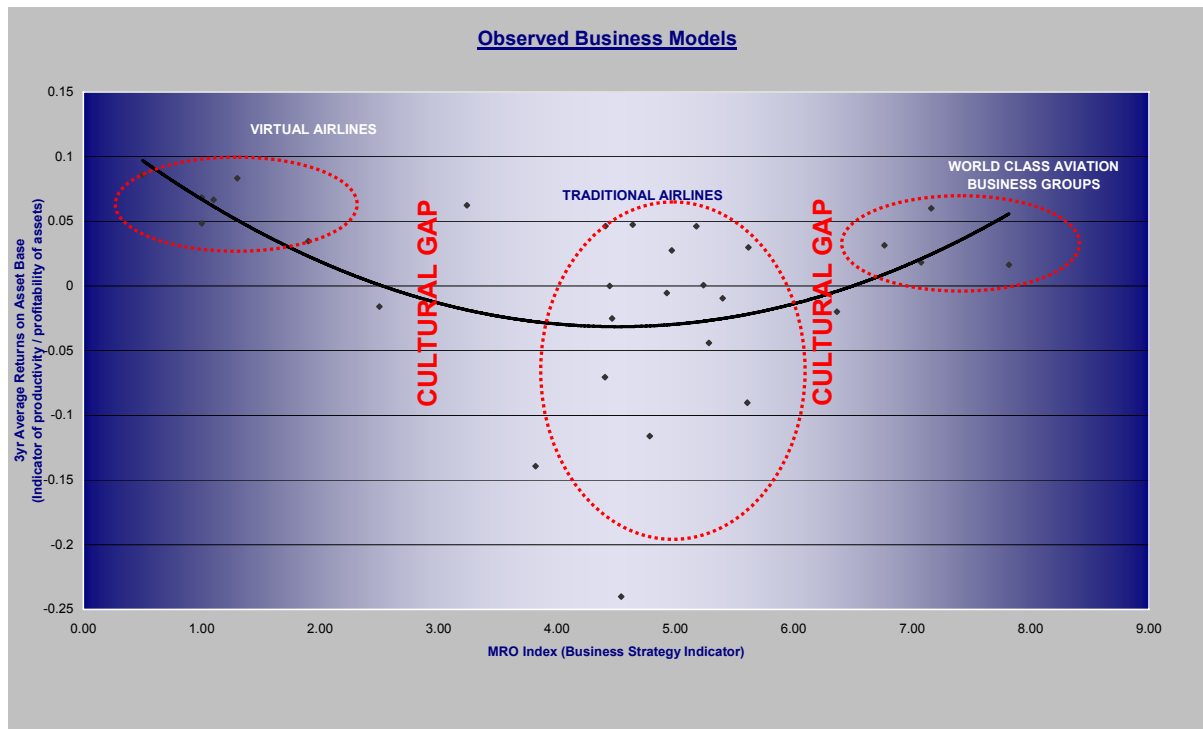


Figure 6. Financial performance of airlines (Rolls-Royce, 2005)

The trend evident is that financial performance varies with the MRO index, with the best performance being achieved at either end of the scale, either those companies handling no MRO internally (virtual airline) or those offering the full range of services (business aviation groups).

Clearly, it is therefore possible to infer that the company operating a traditional business model struggles to remain competitive; the successful companies are adopting either a strategy of cost reduction, moving to the virtual airline model or becoming aviation business groups which increase revenues by finding new services that can be offered to other airlines. Generating profit solely from ticket revenues is difficult to do without lowering the cost based significantly.

4.5. IMPLICATIONS OF THE AIRLINE BUSINESS MODEL FOR THE AIRFRAMER & ENGINE OEM

The business model for the OEM will be discussed in detail in Sections 5 and 6. However, there is a clear link between how airline choose to structure their businesses and how the OEM will generate revenue that it is appropriate to discuss now.

The virtual airline model focuses on cost control and core capabilities, and therefore for the OEM, whereas the traditional airline and the business aviation groups focus on reaching a number of markets with a broad range of services. However, it is not clear that the business model adopted by the airline currently has a tangible influence on the business model of the engine OEM. Briefly (as these will be discussed more fully later in the document) the OEM receives customer revenue through the sale of engines and the sale of aftermarket support and consumables. The predominant business models are either to make margin on the engine, or to use the aftermarket (through long term service agreements) to cross-subsidise a discounted engine price. The decision for the airline between how they structure the deal with the engine OEM is a balance between the price (either upfront or ongoing) between the

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risk of owning the engine, the ongoing costs and the potential benefits of economies of scale and simplification. These decisions are comparable regardless of the airline business model.

However, implicitly, aviation business groups offer a broad range of MRO operations themselves, and provide these services to a broad range of airline customers. As such, although they are customers to the OEM for the original equipment, these airlines also act as competitors in the providing services to the aftermarket.

The sales strategy adopted by the OEM must also account for risk. As the price of the engine is discounted risk is transferred to the aftermarket and as such the engine OEM has a tangible stake in ensure the engine stays on wing and operational.

As previously mentioned the virtual airline model focuses on excellent contract management and an area where there is evidence that this had influenced the engine OEM is the size of the deal negotiated. Ryanair and Easyjet have both conducted competitions for the supply of 100 aircraft within a single deal. As such this presents the opportunity for the airline to negotiate significant discounts and guarantees. With this trend, the customer mix changes for the OEM. Previously many deals will have been completed for a large number of airlines and a relatively small number of engines. With the virtual airline model, the potential is for a smaller number of customers, with far greater buying power and large deals being done.

5. AIRFRAMER & ENGINE OEM

In the market for large civil engines there are six Engine OEMs for Airbus and Boeing engage with. Rolls-Royce, General Electric and Pratt and Whitney being the three prime manufacturers and their joint venture (JV) partnerships on IAE (RR, PW, MTU and JAEC), CFMi (GE and Snecma) and the Engine Alliance (GE and PW).

The formation of JVs gives an indication of how difficult it can be to justify the size of investment required to create an engine programme and also how the changing political map within the industry creates windows of opportunity where companies form alliances where normally they would be competing head on. JVs reduce the absolute return for an individual partner but will reduce the investment required as well. JVs can also reduce the risk of not being selected on a particular airframe where partners are unsure whether they are creditable on a standalone basis.

Historically, engine manufacturers have developed engines in isolation of the airframe application but with gas turbine technology moving from revolutionary to evolutionary it has become increasingly important to integrate the power plant design with that of the airframe. By integrating the powerplant design airframers can maximise the benefits of new technology and increase the performance gap between any new aircraft and its predecessors.

The relationship between engine performance and aircraft performance is so closely linked now that the engine forms a disproportionate amount of the savings generated by a new design. An engine's design and the knock-on through life cost become significant cost drivers for operators and can significantly influence the competitiveness of a particular airframe. This reliance on engine performance creates an unusual relationship between airframer and engine OEM and also onward to the operator.

The commercial relationship between the airframer, engine OEM and operator becomes a three way relationship rather than the expected operator to airframer, airframer to engine OEM. The engine OEM sells installed engines to the airframer who then sells the complete airframe/engine package (the aircraft) to the operator. However, the operator negotiates with both the airframer and engine company to secure concessions against the list price of the aircraft. In competitions between types of airframe there may be a significant price

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competition where pressure is brought on both the airframer and engine OEM. Once the airframe choice has been made a further engine competition may ensue where the engine OEMs compete to secure their position driving the concessions higher.

With multiple combinations of airframe and engine combinations where there are 3, 2 or sole source engine choices, very different relationships arise between airframer and engine OEMs. An example of this would be the difference between the Airbus and Rolls-Royce relationship on the A330 and A340 programmes.

The A330 relationship may prove to be the last of the traditional engine competitions where an operator has the choice of three different suppliers for its engines. In this case Airbus has little tie-in with the engine companies and as the competing 777 aircraft is also available with three engine choices the market is in a state of relative equilibrium. In this case no single engine price should affect the airframer's ability to sell its aircraft and competition law prevents an engine manufacturer from offering more favourable concessions against one airframer's product than the others.

The A340 relationship shows how polarised the relationship can get. Rolls-Royce provides the only engine for the A340 which competes against the long range variants of the 777 powered exclusively by GE. In this market the partner style relationship means that to be competitive each airframer and engine manufacturer needs to cooperate. In this case the engine price agreed with the customer directly impacts the airframers ability to sell its product unlike airframes that have a choice of engine whether competition between the engine manufacturers help relieve some of the commercial pressure from the airframer.

In other markets a slightly different commercial relationship exists. Primarily on smaller aircraft the airframe manufacturer usually has a supply contract with an engine company with the price agreed in advance. This may be for engine sets when required or may take the form of batch orders for multiple ship sets. The airframer is then free to market the aircraft deciding how much concession to give independent of the relationship with the engine OEM. The engine OEM may have a relationship with the customer for in-service support but is not generally involved with the aircraft sale.

There are many variations of the relationships described above each being formed around a particular set of circumstances and market pressures. At the start of each new programme these relationships are remodelled so creating even more diversity in the relationship.

Based on this discussion a description of the business model operated between the engine OEM and the Airframer is shown in figure 7.

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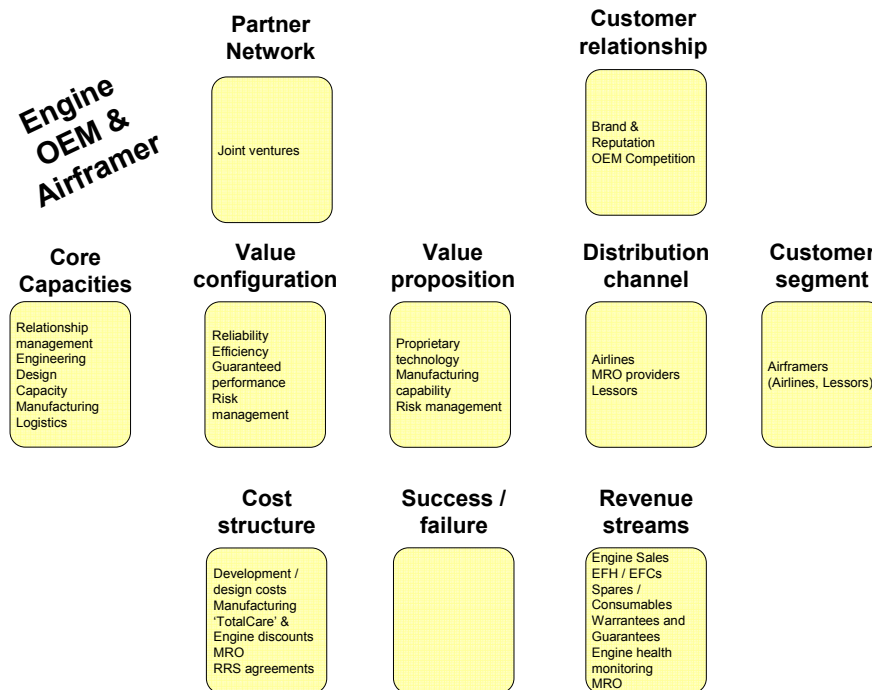


Figure 7. Business model for OEM – Airframer tier

6. ENGINE OEM & 1ST TIER SUPPLY CHAIN

The nature of civil aerospace projects creates challenges within the supply chain unseen by other industrial sectors. Programmes are complicated by the nature of the solutions and heavily regulated to maintain acceptable safety levels, while the price of the assets and costs of the development programmes need to be written off over a long period of time, sometimes more than 25 or even 40 years. These challenges have shaped the nature of the relationships within the supply chain over the past decades.

The passage of time has seen an evolution in thinking in supply chain relationships.

Originally, “arms-length” style relationships where a manufacturer would approach a supplier to make a few parts to their design were the only approach. This meant the OEM retained most risks with few risks shared with the supplier, the primary one being the ability of the supplier to deliver on time. The short-term nature of the relationship gave limited scope for any supplier to invest in improving costs or techniques as the manufacturer could change suppliers regularly and at will.

As complexity and costs increased different relationships with the supply chain offered lower costs and risks. Long-term agreements (LTAs) gave suppliers security of tenure in exchange for lower prices and guarantees on quality and delivery performance. OEMs still retained the design rights and possibly the manufacturing technology, leaving the supplier to optimise the manufacturing process.

As these relationships developed the capabilities of the suppliers increased to the point where the OEMs started to question their own policy of internal manufacturing with each part or sub-system being evaluated against a make/buy decision matrix. As the OEMs reviewed increasingly more complex components a third and final relationship style developed.

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The Risk and Revenue Sharing Partner (RRSP) developed out of the OEMs desire to “buy” more of the engine components and also to share the ever-increasing programme costs and risks with partners. In exchange for an entry fee a RRSP secures a percentage of the revenue generated by the programme whilst securing its position as a supplier for the life of the programme. This aligns the RRSP with the OEM giving common goals and benefits. It also strengthens the OEMs ability to compete to secure a position on a particular airframe as the OEM no longer has to find all the funding required to cover both the R&D bill and the entry fee now commonly demanded by the airframers.

In an ideal RRSP relationship the partners share all risks and revenues and in doing have a transparent view of each others part in the programme they share. This utopia is not always achievable from a commercial perspective and leads to partial sharing relationships. OEMs may feel unable to share all details of the contracts with airline customers leading to partial sharing. Suppliers may be unable or unwilling to share in particular programme risks, again leading to a partial sharing relationship.

There is not really a “best” business model between the engine OEM and the 1st tier of the supply chain. The nature of these relationships changes dependant upon many factors including the OEM’s position with the airframer and the risk appetite each party to the agreements has. When times are hard for the engine OEM its desire for cash to fund its programme may out weigh the lack of risk transfer to the supply chain. As financial health becomes less important the premium paid by a supplier for access to the programme may change from cash to risk or a balance of the two. It could be argued that this balance is healthier as the relationship has greater alignment and the contract should become easier to manage.

As with most risky environments, having a portfolio of relationship types is likely to be the safest approach and this can be demonstrated in the varying relationships seen between engine OEM and supply chain.

7. 1ST TIER & NTH TIER SUPPLY CHAIN

For the 1st tier supplier the relationship upwards in the extended enterprise value chain is quite simple. These companies get their demands from the OEM and they break them further down in the value chain to the Nth tier suppliers. 1st tier supplier is a company that has OEM companies as customers and a Nth tier supplier can be raw material supplier to a 1st tier supplier or a 1st tier supplier that delivers to another 1st tier supplier, then its called Nth tier supplier.

In the aero engine business one company can be on different levels in the value chain depending what engine program and OEM it works for. An example can be that Volvo Aero, a 1st tier supplier, serve the OEM Rolls Royce on a certain program and on the other hand in a different engine program for Rolls Royce it can act as an Nth tier supplier to another company which acts as an 1st tier supplier to Rolls Royce

The commercial relationship between the 1st tier supplier, engine OEM and airframer normally becomes a two way relationship rather than three way relationship. The requirements regarding new engine manufacturing from the OEMs are pushed down the extended enterprise value chain. Although to create relationship with airframers and airlines can create customer value and expand the business for the 1st tier suppliers.

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In the aero engine aftermarket the situation is completely different, where even small shops need relationships with airlines, OEMs and other companies in the extended enterprise value chain. The complexity of the business model is shown in Figure 8.

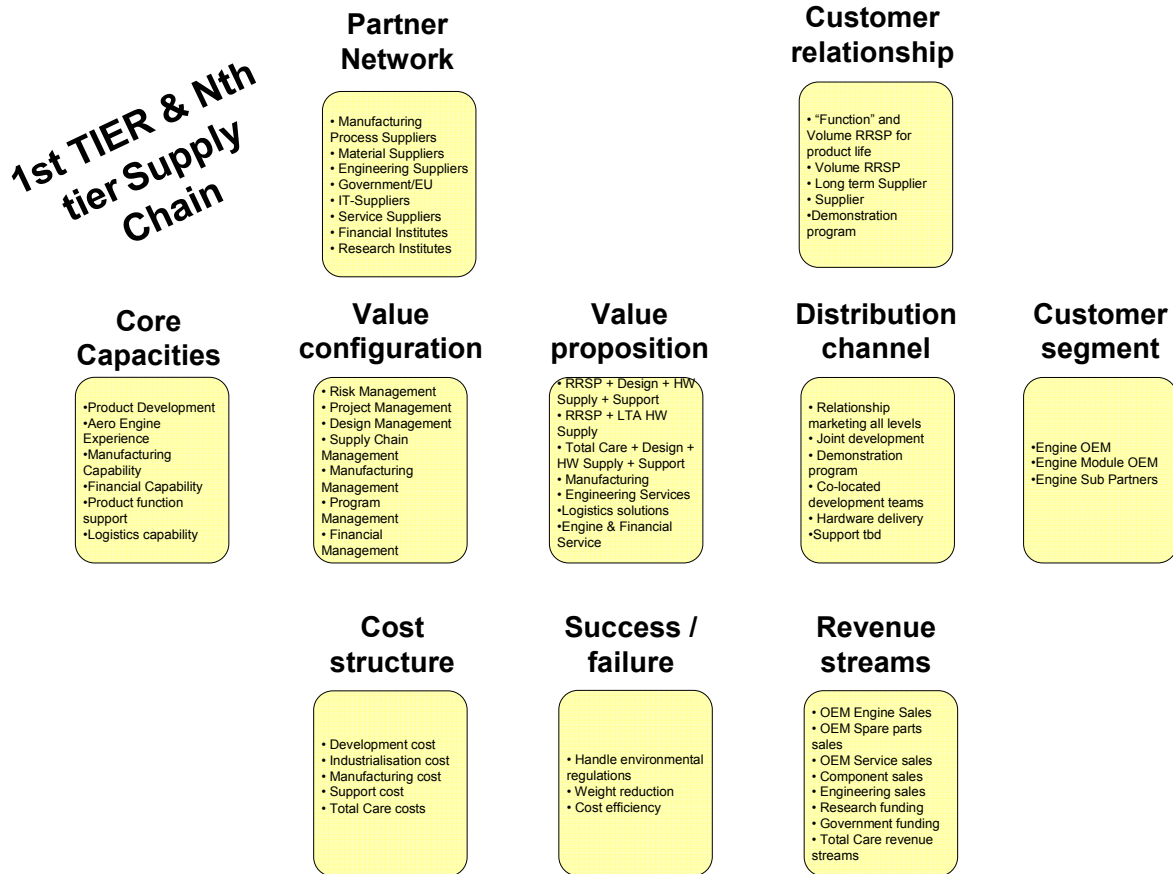


Figure 8. Business model diagram for 1st tier supplier with supply chain

Success / failure

1st and Nth tier suppliers must continually strive for workshare on the various OEM engine programmes. The main competitive factors for the 1st and Nth tier suppliers are environmental improvements (noise level), weight reduction, cost efficiency, ability to create relationship and financing.

No one in the supply chain can solely develop engine parts that satisfy all environmental demands, therefore there must be system integration between the OEM, 1st and Nth suppliers to solve the environmental issues on a higher level. The tight integration between the companies in the value chain forces the companies to be very dependent on each other. The ability to create tight relationship with a winning partner is therefore a key to success. To get into a new program costs tremendous amount of money and what owner wants to spend money today that he/she might get back in 30 years. The need for financing is always an imminent issue.

It is hard to develop unique knowledge (with little involvement from OEM) in the business. To be competitive on the 1st tier supplier level in the extended enterprise value chain the companies need to be good at creating customer value by handling weight reduction and cost efficiency.

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Value Proposition

For the 1st tier supplier there are several ways of doing business with the OEM. A full sharing risk and revenue sharing partnership (RRSP) contract includes design responsibility, hardware supply, product support and to be a service provider. There are very few contracts that consist of a full sharing contract, always some risk that are negotiated.

The risk sharing element of a full sharing contract consists of sharing 100% program risk. The program risk involves fluctuations in engine price, exchange rate, customer credit risk, raw material escalation, volumes, deliveries and all activities involved with Nth Tier Supply Chain. The RRSP contract demands stability in the supply chain and it also creates more collaboration within the commitment. As a full sharing RRSP the supplier participates in all costs and revenues generated by the programme. As a result if the OEM provides engine maintenance and support through long-term service level agreements like TotalCare® or OnPointsm the supplier would share in the revenue received under those contracts.

Partial sharing RRSP contracts are outlined differently for every customer and engine program. The starting point is a full sharing RRSP contract but some of the risk can be negotiated to be taken by the OEM. Examples of risk which that can be limited are concession fee, volume risk and material procurement. These customer adapted solutions give the 1st tier supplier less risk but also a lower possible revenue stream in the future.

A Long-Term Agreement (LTA) is a contract where the OEM carries the programme risk and the supplier only takes the volume risk during the contract period. The Design authority stays with the OEM. Normally these contracts are very short, 5 to 10 years with possible break clauses, which give the rights to terminate after due date if they wish to do so. The main risk involved for the 1st tier supplier in these contracts is the volume scenario over the contract period. The OEMs are not really interested in these contracts on a higher level. The purpose of these contracts is more of outsourcing nature and the main target for OEMs the OEM is to compare cost/unit price and on time delivery.

Similar types of LTA contracts are often also used in the value chain between the 1st & Nth tier supplier. It's frequently used and the Nth tier supplier carries very little risk and the main goal is to offer the right price. Figure 9 indicates how the risk is altered by the business model.

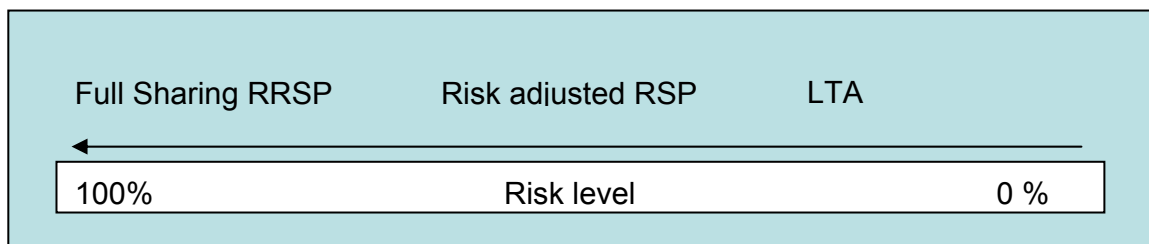


Figure 9. How the risk alters with the business model

Customer Segment

There are very few OEMs in today's aero engine industry. Reasons for this are that very few companies are capable of integrating the power plant design with the airframe and the supply chain is very complicated; its more for technical than financial reasons. Even if the OEM makes all decisions regarding engine configuration and they handle all the integration towards airframe manufacturer they need partners, although it would be easier for the OEM if partners were not needed. The enormous competition between the OEMs forces the 1st tier suppliers to have very close ties and contribute with technology to OEMs. The high

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competition between the OEMs pushes them to offer substantial concessions, which also affect the 1st tier suppliers.

There are also other target customers for the 1st & Nth tier suppliers; Engine Module OEM and Engine Sub Partners. Some Engine Module OEMs can also act as 1st tier supplier to an OEM in a different program. An Engine Module OEM holds a share in the engine as an RRSP and uses 1st tier suppliers or sub partners, Nth tier suppliers, to manage their mission.

Distribution Channels

Many companies are using alliances and partnerships to position themselves on the market and to get closer to their customers. The number of aero engine manufactures is quite small and therefore to be a partner in the market you need to demonstrate a technological advantage. The first step to show new technology is to prove it in a demonstration program together with the OEMs and other partners.

Several 1st tier suppliers also use joint development teams with other suppliers and relationship marketing on all levels to get into new programs. Continuing a successful relationship is a natural way of doing new business. The aero engine business today is very conservative regarding changing partners; the risk level increases when changing, and there is no need for change if the relationship works today.

Customer Relationship

Many 1st tier suppliers establish alliances and partnerships between themselves and the OEM's. The initial contact for the relationship often starts during a demonstration program, where new knowledge is demonstrated, and it develops further when the RRSP-contract is signed. To work well, an RRSP deal requires a close relationship between the partners to solve all challenges during the program life; this gives many reasons for having frequent programme meetings. For the 1st tier suppliers these meetings can also be seen as a way of continuously having dialogues with the OEM in order to maintain the relationship.

Value Configuration

1st tier suppliers provide different customer solutions to different customers and many of them offer a wide range of hard and soft products. To be able to deliver a value proposition consisting of RRSP, design, hardware supply, support and service provision there must be activities and resources ready to support the offer. Design Management and Project Management are key activities that must be performed to be able to deliver hardware that meet customer requirements. Manufacturing Management, Service Management and Supply Chain Management are needed for supplying the part to the customer. Program Management involves taking care of the on-going business and the function helps the customer with all activities during program life. Program Management needs to work closely with Financial Management and Risk Management.

Core Capabilities

The value configuration shows the resources and activities needed to support a customer offer. The Core Capabilities are the ability to execute a repeatable pattern of actions that is necessary in order to create value for the customers. For 1st tier suppliers this means the ability to handle their own processes and deliver the demanded quality for Product Development, Manufacturing, Product Support, Logistics and Financial services. Developing new capabilities takes a long time and it must be proven to a certain technology readiness level before offering it to new engine customers. The strategic decision of the company decides which capability is prioritised and what components the company should offer the customer.

This document is classified as VIVACE Public**Partner Network**

A natural way to create a partner network is by taking part in the EU demonstrator programs which are very important for the 1st tier suppliers. In these projects OEM, 1st and Nth tier suppliers meet and contribute with their knowledge. Depending on the knowledge that is asked for in the project one company can offer manufacturing, material supply, engineering work or contribute with all activities in one package. To finance the different projects there is always a need for money, which can be funded with free cash within the business, from financial institutes or government loans.

Cost Structure

Development of new aero engines is extremely expensive and very few companies can carry out the complete investment by themselves. In a RRSP offer the main competitive factors are development cost and industrialisation cost; these costs are very high and require good finance solutions.

Many 1st tier suppliers are working with different partner solutions regarding manufacturing which makes it easier to find an attractive cost for different components depending on the complexity of the part. Generally it is harder to find outsourcing opportunities for the developing phase than to find a “make to print” firm that can handle the manufacturing.

In a full sharing RRSP all transactions are shared by all partners. This means that even if a 1st tier supplier only contributes with product development and manufacturing it must take part of the whole program cost and revenue streams. Sharing all transactions limits the risk involved when only relying on sales figures for new manufacturing but the full sharing RRSP also includes transactions which today have a lower margin, such as overhaul. Examples of costs that a full sharing RRSP deal includes airframer costs, operator cost, overhaul cost, cost for spare parts, sales cost, finance cost, other miscellaneous costs and concessions.

Revenue Streams

Depending on contract type; revenue streams will look different for each program. An RRSP contract in today's aerospace business gives a long payback time, perhaps 15-25 years. The risk involved with such a long pay back time are significant. For RRSP contract 1st tier suppliers get their revenue based on engine share, sometimes this includes OEM spare parts and sometimes it doesn't.

A Total Care deal involves all transactions and regarding revenue streams these come from airframers, operators, overhaul, spare engine sales and finance revenues. By taking part of all these revenues the 1st tier supplier buys certainty but reduces its return. It will get a less fluctuating cash flow curve over time.

LTA gives the 1st tier suppliers a revenue stream based on volume sold multiplied by price per part. Investments such as engineering cost, tools, starting cost and other expenditures can either be included in the product price or received as a Non Recurring Cost (NRC).

Financing research can sometimes be very expensive and sometimes governments can contribute with some funding to various projects.

8. DISCUSSION & CONCLUSIONS

In completing this document it has proved difficult to develop comprehensive models for the business model at each tier of the value chain. From this it is evident that many of the actions of each partner are reactive to the upstream tier in the value chain. An example is the engine OEM, where the product offering to the airline is structured to respond to the exact

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requirement of the airline. As such it may be considered that the business model is a position on a sliding scale.

Some of the trends highlighted relate to the high competition and risks, high investment levels and long payback timescales required to be part of the value chain. High competition between OEMs has lowered the engine price, creating a reliance on the aftermarket for the OEM to achieve break-even. As such risks have increased and the OEMs have sought to offset these by sharing risks with key supply chain partners. The trend for risk-sharing leads to a situation where cash is essentially being borrowed from the lower tiers of the value chain.

This lack of an identifiable and coherent strategy is perhaps indicative of the importance of this work, where in future deliverables for Tasks 2.1.1 and 2.1.2, the implications of current enterprise structures will be considered and proposals made for future developments.

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