Airbus A380 Model Detail
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## Executive Summary

Having flown the first test article in May 2005, EADS seems likely to break records with its 550-passenger A380 passenger airliner. However, the prestige of flying the world's largest commercial airliner may not translate into outsize gains for EADS, Airbus' parent company. This model builds the NPV of the Airbus A380 program from the ground up based on the assumptions set forth in public pronouncements by EADS. While the most optimistic results show a net loss for the program, several likely contingencies could threaten the A380 project and thus damage EADS' prospects for future profitability.

## Company Background

From 1945 till the early 1970s, commercial aviation in the West was dominated by the American giants – Boeing, McDonnell Douglas, and Lockheed. As Europe's economy expanded during the postwar era, the governments became interested in capturing a slice of this market by brokering the creation of the Airbus consortium – a joint venture between British Aerospace, France's Dassault, Germany's Dornier, and a host of other smaller European partners. The first product of this collaboration was the A300, the world's first "wide-body" twin-jet. Filling a niche between smaller, shorter-range models such as the 737 – too small to operate long-range routes – and larger long-range models such as the 747, the A300 was an ideal vehicle for the routes of many of Europe's national airlines, and over 200 were sold. It is still in current production as a freighter aircraft.

The success of the A300 in establishing Airbus as a viable competitor has led to a family of commercial airliners in direct competition with Boeing's line. Airbus' A320 series competes with Boeing's 737, the A310 with the 767, and the A330/340 platform both replace A300s and compete with the Boeing 777. Airbus now occupies about half the world commercial airliner market and outsold Boeing in 2003. Currently the only market segment yet to be filled is the long-range high capacity niche occupied by Boeing's 747-400 series, which were last updated in 1988.

## Argument for the A380

EADS is not alone in conceiving grand ideas for a replacement for the 747, which first flew in 1968 and has seen over 1,300 examples in revenue service. Originally the 747's replacement was intended to be supersonic – the 747's humped flight-deck was intended to facilitate its conversion into a cargo carrier. This future never came to be after the fuel crises of the '70s and '80s turned the Concorde into an expensive luxury. However, passenger numbers have continued to increase year-on-year ever since a deregulated market and economic growth have brought air travel to the masses.

Current air traffic growth trends will stress the capacity of both aircraft and airports. As the original generation of 747s is rapidly approaching its airframe life limits, major international airlines have become increasingly cramped by the capacity restrictions of their hub airports. For instance, London Heathrow only operates two runways from which 67 million passengers must fly annually. This equates to 460 747-loads per day – and the situation will only worsen as urbanization constricts many European and Asian airports from adding additional runways.

Moreover, EADS believes that "fleet commonality" may give its entry into the Very Large Aircraft market an edge over Boeing. Because Airbus aircraft have common cockpits and similar "fly-by-wire" controls and layouts, airliners operating the full range of Airbus products need to maintain a smaller pool of crews and aircraft-specific maintenance staff. For this reason, all-Airbus operators such as Air France and Lufthansa that seek to replace their 747s may be more attracted to the Airbus entry.

**Model Construction**

The model enclosed seeks to model the NPV of the project as of the project inception in 1997. Most figures come from public and business sources, including a well-publicized case-study from Harvard Business School. As such, it is divided into two series of cash-flows – the costs associated with research and development prior to production, and the revenue associated with airframes as they roll off the line.

*Startup Costs*

Startup costs are measured in US dollars and come from public news sources such as the BBC. It is assumed that Airbus spends evenly during each year, and thus we can discount this cost down to present value of $9.7 billion.

*Revenue Stream*

Revenue less taxes is the cashflow coming from the EADS. Because this cashflow comes 8 years after the money is spent, it needs to be discounted backwards down to present value of $847 annually. Now that everything is in present value, we can use a synthetic "Return on Investment" figure with the present values of the first year's contributions as the numerator and the present value of the total costs as denominator.

*Cost of Capital*

Cost of capital comes from Harvard's published case study on this program – a blend of government and industry financing. As with all Airbus projects, European governments offer loan guarantees that insulate the project from failure, which amount to about 28% of costs. This decreases risk premium and cost of capital.

*Market Size*

This table shows the number of seats EADS intends to capture from Boeing based on future traffic growth estimates and their optimistic assumptions on how many will turn to the A380.

**Sensitivity Analysis**

The baseline model predicts a modestly negative NPV over 33 years of R&D and production of 1,200 airframes. Based on simple breakeven analysis the project might be worthwhile if

capital costs are ignored. However, the picture worsens significantly as likely contingencies come into play.

*Reduced Margins*

One of EADS' most questionable assumptions is their assertion that they can achieve a 25% margin on a Very Large Aircraft priced the same as a Boeing 777-300. If costs rise or EADS is forced to offer more incentives to move aircraft, margins could easily decline and impact profitability. This scenario introduces a 20% margin per airframe to the project.

*Reduced Production Rate*

This scenario envisions either that either manufacturing difficulties or slow orders over the life of the project will reduce sales from 48 per year to 40 per year. While 1,235 airframes could very well be produced, slowing economic growth and especially higher oil prices may induce carriers to hold on to their existing aircraft or simply add smaller types than the giant A380.

*Reduced Market Size*

This scenario is the most likely to damage the A380's prospects in the future. One of the major forces affecting the airline industry as of mid-2005 is fragmentation. More airlines are flying point-to-point flights instead of flying through congested hubs. New rules on the use of twin-engine aircraft overwater have made 777s, 767s, and A330s – not large 747s – the most popular airliners crossing the Atlantic. Using a smaller aircraft to deliver passengers directly from the United States to their final destinations in Europe – instead of transferring through London, Paris, or Frankfurt – has proven to be much more popular with business travelers who provide the profits for most major carriers.

Yet even if hub-and-spoke remains the most efficient model for airline operators, Airbus can still be challenged by Boeing if they choose to develop an improved 747 model. While costing little to develop, an improved 747 would almost certainly capture a large part of the market and threaten Airbus' confident capture predictions.

By reducing the "capture" of first generation 747s to 35% to 20% and reducing 747 capture from 85% to 70% we reduce the VLA market from 1,235 airframes to 959 airframes.

*Increased R&D/Longer R&D Period*

These contingencies anticipate difficulties in the design and production of the A380 that take either time or money to resolve. Of the two, time is really the more important since it devalues each and every year of revenue stream more than simply costing more at the outset.

**Conclusion**

The Airbus A380 appears to be a logical progression of the Airbus family into dominating world commercial aerospace, but a quick model of the costs and benefits involved make the decision to commence development questionable at best. In addition to the normal R&D

risks, the A380 is entering an established market which is evolving away from a need for high-capacity airliners. While it is typical for giant aerospace companies to "bet the company" on each new product, this gamble appears to be driven by motivations other than commercial.

# A380 Project Analysis

| **Startup Costs** | |
|---|---|
| R&D | 11000 |
| Tooling | 1000 |
| Working Capital | 2000 |
| Total | 14000 |
| Present Value | $9,724.82 |

All figures are in millions of US Dollars

| | |
|---|---|
| Years to Develop | 8 |
| Years of Income Stream | 26 |

| **Revenue Stream** | | | |
|---|---|---|---|
| Sale Price | 225 | 48 | airframes/year |
| Gross Margin | 25% | | |
| Contribution/Plane | 56.25 | 2700 | contributions/year |
| Tax Rate | 38% | 1674 | after tax contributions |
| | | 847 | discounted contributions |
| Return on Investment | 8.71% | | |

| **Breakeven Analysis** | |
|---|---|
| **Simple Breakeven** | 401 airframes |

| **Cost of Capital** | | |
|---|---|---|
| Governmer | 28% | 6% |
| Industry | 72% | 10% |
| Cost of Capital | | 8.89% |

**Market Size**

| | New Seats | Conversion Rate | Potential VLA Seats |
|---|---|---|---|
| Widebody Twin Fleet | 328,886 | 10% | 32,889 |
| 1st Generation 747 | 424,667 | 35% | 148,633 |
| 747-400 | 585,648 | 85% | 497,801 |
| | | Total | 679,323 |
| | | Seats/VLA | 550 |
| | Total VLA Market | | 1,235.13 |

| **Project NPV** | |
|---|---|
| Total Sales | 1,235 |
| PV of Contributions | $16,722.78 |
| Discount to Present | $8,459.23 |
| PV of Costs | ($9,724.82) |
| NPV | ($1,265.59) |
| Years of Production | 25.73 |

**Summary of A380 Project Scenarios**

| | NPV ($ Millions) | Return on Investment | Present Value Contributions | Breakeven Airframes (Simple) | Footnote |
|---|---|---|---|---|---|
| Baseline Model | ($1,265.59) | 8.71% | $8,459.23 | 401 | 1 |
| Reduced Margins | ($2,957.44) | 6.97% | $6,767.38 | 502 | 2 |
| Reduced Prod'n Rate | ($2,360.88) | 7.26% | $7,363.94 | 401 | 3 |
| Increased R&D | ($1,960.22) | 8.13% | $8,459.23 | 430 | 4 |
| Reduced VLA Market | ($1,936.39) | 8.71% | $7,788.43 | 401 | 5 |
| Longer R&D Period | ($2,703.94) | 7.50% | $5,898.45 | 401 | 6 |

1 - Baseline model assumes that everything goes according to the EADS orginal plan of 25% margin per aircraft, 48 airframes per year sold for $225 million each.

2 - Margins drop to 20%.

3 - Only 40 a/c can be produced annually.

4 - Neccesary R&D increases by $1 billion.

5 - VLA market shrinks from 1,235 airframes to 960 airframes.

6 - R&D Extends by 2 years to 10 years