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Boeing and Airbus: Next-Generation Products — Demand Continues as the Advantage Shifts Toward Boeing

SEPTEMBER 2006

Expect a next wave of demand for narrowbodies and widebodies within the next 18 months as orders shift to U.S. and European legacy carriers

Broad market coverage is key: this is why Airbus's current plan for the A350 is too small and why the next narrowbodies should cover 90-210 seats

Boeing's 787 supplier partnerships may limit Airbus's risk-sharing opportunities: Boeing can leverage Japan to help cover the 90-210 seat range

Overview

Airbus and Boeing are developing their next widebody airplanes, with narrowbodies likely to be launched before the end of this decade. We also expect a next wave of demand for both sets of products. Decisions being made now by each company likely will define their long-term competitive positions. Boeing is currently well positioned on both widebodies and narrowbodies based on the strength of its 787 supplier relationships.

In Part I, we assess positive market trends for widebodies and the outlook for Boeing's 787 and Airbus's A350. We also highlight the structural disadvantage faced by Airbus with Boeing's 787, as Boeing increasingly raises the level of supplier involvement and furthers its lead in widebodies.

Furthermore, Airbus is now making key decisions on the A350. We believe Airbus should place the A350 firmly against the 777, rather than straddle midsize and large widebody markets. Competing with the older-technology 777 should offer Airbus a better chance for differentiation than going against the 787, where little differentiation opportunity seems to exist and the A350 is late to market. Airline models are evolving to take advantage of a more diverse set of aircraft options, as seen in changes in fleet mix. We believe Boeing is currently advantaged, with a broader portfolio that offers better coverage of the range/payload space with commonality than does Airbus's portfolio. With the A350, Airbus may face challenges in risk-sharing with the supplier base, given the scale of efforts underway at major suppliers on the 787.

In Part II, we explore the key issues as both companies make decisions related to narrowbody products in the context of strong demand.

In narrowbodies, Airbus has an advantage over Boeing with leadership in the installed base, which typically translates into orders as airlines seek a single supplier. While Airbus's lead is narrow, we think part of its advantage has been broader market coverage, particularly with the A321. As we move to next-generation airplanes, commonality with the current base becomes less important, which should open up competition for Airbus and Boeing.

We expect Boeing and Airbus to broaden their coverage of the narrowbody space, moving down toward 90 seats and up to 210 seats, an approach that would help airlines meet a wider range of network requirements. Such a strategy would mean two new narrowbody airplanes, resulting in substantial investment. Boeing's partnership structure on the 787, particularly with Japan, may enable it to take the lead in developing two new airplanes. Boeing also has the resource advantages of completing its 787 well ahead of Airbus's A350 and the ability to leverage its 787 composite technology.

We rate Boeing outperform with a target price of $101, based on Boeing's widebody position, a long commercial upcycle and ongoing commercial margin improvement. We rate EADS market-perform with a target price of €23, based on an expectation of strong short-term performance, but long-term issues related to Airbus's product positions and margin pressure.

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Part I: Widebodies — Boeing's Lead and the Airbus Challenge

Airbus and Boeing are in the middle of developing their next widebody airplanes, with narrowbodies likely to be launched by both companies before the end of this decade. In our May 2006 publication, *Commercial Aircraft Upcycle — Climbing Higher With Global Demand*, we discussed the positive market trends and widebody positioning for Airbus and Boeing. In this publication, we describe the key issues going forward as both companies make decisions that are likely to define their long-term competitive positions. In this chapter, we focus on the widebody competition, whereas Part II concentrates on the narrowbody picture.

Airbus's decisions over the next two months on the A350 are likely to determine the company's long-term widebody strategy. We believe Airbus should place the A350 firmly against the 777, rather than trying to straddle midsize and large widebody markets. By straddling segments, Airbus risks setting itself up for a long-term disadvantage, with product gaps in its portfolio unless it is able to significantly modify its narrowbody approach. Competing against the older-technology 777 should also offer Airbus a better chance for differentiation than going against the 787, where there appears to be little differentiation opportunity and the A350 is late.

Generally speaking, airlines want options to enable new business models, rather than a limited number of range/payload choices that constrain their networks. Airline models are evolving to take advantage of a more diverse set of aircraft options, as demonstrated by changes in fleet mix over time. In widebodies, Boeing is currently advantaged, with a portfolio that offers better coverage of the range/payload space with commonality than does Airbus's product portfolio.

Airbus's failure to understand the inadequacy of the A340 was the real source of the company's current product development issues. Despite the comments of many critics, we believe the issue is not the A380, which we see as a niche product, but the continued investment in an inherently inefficient A340 design. Staying with the A340, combined with Boeing's 787 launch against the A330, made Airbus's gap in product competitiveness much larger than Boeing's in the late 1990s. Boeing's gap was a single product, the 767 versus the A330. It is only this year that Airbus has decided to stop A340 investment.

With the A350, which is designed to compete with Boeing's 777 and 787, Airbus faces challenges to leverage the supplier base given the efforts underway at major suppliers to support the 787. At the level of 787 production volumes being considered (14 per month in 2011), Boeing should more than cover all replacement demand before Airbus has even put an A350 in service. Suppliers will also need to continue investing to ramp up on the program. With the world's largest aerostructures companies stretched to deliver on the 787 into 2011, we expect Airbus to have more difficulty setting up risk-sharing agreements with key suppliers, potentially delaying the A350.

Recently, Boeing announced cost overruns on 787 research & development (R&D) costs (which represent the majority of a $500 million add for 2006-07), which should be viewed as normal for a Boeing development program, in our opinion. The real issues to watch are significant performance problems or delays on the program. We have not seen evidence of either misstep; furthermore, the area of greatest innovation, the use of composites, no longer appears to be a primary concern. Supplier performance will, however, be a critical area to follow. It is also Boeing management's number one focus. If Boeing gets the airplane right, the upside should be far greater than the additional R&D costs incurred. The right design would also set Boeing up for long-term technology leadership in composite structures, in our view.

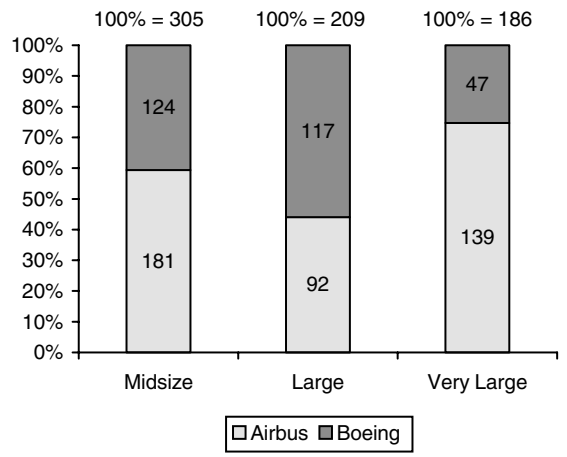
We continue to rate Boeing outperform with a target price of $101 and EADS market-perform with a target price of €23. Our EADS rating is based on a long-term expectation of weakness in widebodies and margin pressure, driven by underperformance on cost-reduction initiatives, aggressive widebody pricing and unfavorable exchange-rate conditions. We see the cost issue as particularly important for Airbus and look to new CEO Christian Streiff to define the approach to strengthen Airbus's long-term margin prospects, as the company faces serious exchange-rate hurdles.

The Decline of Airbus's Widebody Position

The recent widebody crisis at Airbus has been long in coming. Many critics point to the A380 as the reason for the company's difficulties. While the A380 has tied up substantial engineering resources and recovery of the initial investment for the airplane may prove difficult, we do not see the A380 as the principal reason for the company's problems today. In the end, we expect that the A380 will provide a niche capability on thick (generally long-haul) hub-to-hub routes that will be valued by many airlines. Long term, the airplane may even prove more valuable in a larger version (e.g., A380-900, A380-1000), as bigger is likely to be better for those airlines focused on dense routes (e.g., London-Singapore, Frankfurt-Tokyo). Despite recently announced delays, we believe the A380 will ultimately be a key addition to a number of airlines' fleets, some of which have already planned their route structures around it.

Airbus's decline in the widebody market is illustrated by Exhibit 1 and Exhibit 2. From 2001 through 2004, Airbus led Boeing in widebody orders by a substantial margin, with the exception of the large segment (A340 versus 777). Since 2004 Airbus's position has dropped across the board. In the very large segment the drop is understandable because most airlines with an interest in the A380 are now waiting to see how the airplane performs in service before placing an order.

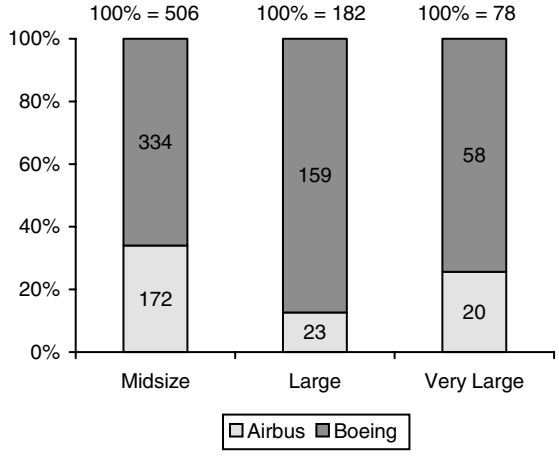
Exhibit 1 Widebody Order Share (2001-04)



Note: Midsize widebodies include A330, A350, 767, 787; large widebodies include A340, 777; very large widebodies include A380, 747.

Source: Corporate reports and Bernstein analysis.

Exhibit 2 Widebody Order Share (2005 Through July 2006)



Note: Midsize widebodies include A330, A350, 767, 787; large widebodies include A340, 777; very large widebodies include A380, 747

Source: Corporate reports and Bernstein analysis.

The A340 Was The Problem

We believe the biggest mistake that Airbus made was the A340. The launches of the A340-500 and A340-600 may have appeared attractive at the time, with the additional range that these airplanes provided and the implied safety advantage in the company's marketing strategy of "Four Engines for Long Haul." This was, however, a flawed strategy, given the inherent inefficiency of four engines relative to the twin-engine 777 (both maintenance and fuel economy). While the A340-500 and A340-600 had short-term advantages over the 777s on the basis of range, Airbus should have seen that those advantages would be transient with the introduction of the GE90-115B engine. Even the implied safety argument failed, given the high reliability of the 777s and early problems with the A340 engines and fuel systems.

Yet, even after the introduction of the 777-300ER and 777-200LR, Airbus continued to push forward with the A340 with the introduction of a high-gross-weight version in 2006 and longer-term plans for a new derivative of the A340 using a version of the Trent 1000 engine. This latter derivative was unlikely to enter service until at least 2010 and received little support in competitions versus the 777 (e.g., Qantas).

The problem with Airbus's ongoing investment in the A340 has been that this large widebody portion of Airbus's product line stagnated at a time when Boeing was leapfrogging Airbus in midsize widebodies with the 787. Airbus now faces the problem of needing new products in two segments, which is a much worse situation than Boeing faced five to seven years ago, when it needed to focus on product replacement in only the midsize widebody segment.

Airbus's two-segment gap is compounded by the delay of the A380, ending of the A300 program, and a shortfall in its cost-reduction efforts. We believe there will be pressure to keep line rates up in Toulouse, where the A330 and A340 are manufactured, which means low pricing for these two airplanes. The A330 remains a strong current-generation airplane and will

likely be used as bridge capacity for A350 customers (already being done with the Singapore order). Nevertheless, in an industry where list prices are virtually meaningless numbers, once an airplane becomes a "bridge capacity" solution, negotiated prices drop rapidly. We are concerned that low-priced sales of these airplanes will add to Airbus's margin challenge.

Market Evolution: About Providing Capabilities, Not Predicting the Future

Avoiding the Forecasting Pitfalls

Boeing's commercial market outlook and Airbus's global market forecast typically look at demand over a 20-year period, for which we believe it is extremely difficult to predict the evolution of airlines. For example, in the early 1990s when we saw the emergence of ValuJet with a fleet of DC-9s, few would have predicted the global success of low-cost carriers using new equipment 10 years later — a success that has reshaped the industry. Furthermore, different fuel price scenarios have a tremendous effect on the long-term rate of replacement and on the preferred size of aircraft.

The truth is that the equipment enables the airlines in ways that neither Airbus nor Boeing (or even the airlines) are able to predict. When the 767 was introduced, the intent was to deliver an airplane that would be ideal for transcontinental flights. But, this airplane instead became the workhorse for transatlantic flights and was used on high-density routes by Japanese carriers. The emergence of today's low-cost carriers as a major force was much more the result of capabilities introduced by new equipment than anything else. The introduction of the longer-range A320 and 737-NG families suddenly enabled fuel-efficient transcontinental flights by carriers that had been confined to regions with previous-generation 737s or MD-80s. Suddenly, Southwest Airlines was no longer a southwestern carrier, but a national carrier. These longer-range capabilities also enabled JetBlue's route structure and subsequent success. The availability of the Embraer 190 is now enabling still further business model changes at JetBlue, even though labor scope clause restrictions may limit its penetration at many other carriers for now.

In their long-term market forecasts, Boeing and Airbus typically describe where they expect demand to fall in terms of aircraft size over the next 20 years. Not surprisingly, the high-demand segments are almost always those that coincide with each company's most competitive products. Boeing has long predicted few sales for very large widebodies, downplaying the potential for the A380. Now with the launch of the 747-8, that forecast has been increased. Similarly, Airbus has long described a small market for airplanes in the 300-375 seat range, where its weak A340 lies, but now expects a better market as it introduces the A350XWB.

The danger that both Boeing and Airbus face is an overreliance on two factors in making product decisions. The first is using the output from long-term macro forecasts, which can give at best a high-level picture of global demand over the very long term (rarely possible to predict). The second is depending on input from the sales force regarding specific designs that fit individual carrier needs. Such point solutions have resulted in suboptimal paths (e.g., Lufthansa's A330-500 and Singapore's 747-XQLR — both of these were ultimately dropped), some of which were followed (e.g., Delta and Continental's 767-400). We would also include the extreme customization allowed customers on the A380 (and the huge problems that have resulted) as an example of this kind of failure.

The challenge Airbus and Boeing face is to improve forecasts for the medium term (5-10 years), rather than near-term sales or long-term macro-trends. We believe that Boeing's development process on the 787 was one of the few times that an airplane was designed as a reflection of broad market input. Still, even that airplane suffers from the point solution for JAL and ANA, with the 787-3 version, which is unlikely to sell to any other carriers. But, the highly successful launch of the 787 is set to deliver a design that should work well for a large number of airlines.

We have been concerned over the degree of influence that a few high-profile carriers may have on Airbus's A350 decisions. Although the earlier version of the A350 was not fully competitive with the 787, our feedback indicated that the airplane could have been sold to many carriers with an appropriate discount (even if Singapore and Emirates would have turned down the airplane). The earlier version of the A350 would have had the advantages of using the existing facilities and tooling in Toulouse, significantly lowering development costs and making possible a launch in 2010.

All Sizes Matter — Risk of an Incomplete Product Line

We do not believe there are clean breakpoints in what airlines need in terms of range and payload. Airline business models are typically confined to operating within the constraints of available products (e.g., no choice but a DC-10 or a 747). As we indicated above, airlines often do not end up doing what they or the manufacturers expect with their products. As new capabilities emerge, airlines learn to optimize their route structures to use those capabilities. Because of the long lead time in aircraft development, manufacturers generally cannot respond quickly to new airline needs — and often would not want to, given that airline business model changes often have short lifetimes (e.g., American's "More Room in Coach" and Delta's Song).

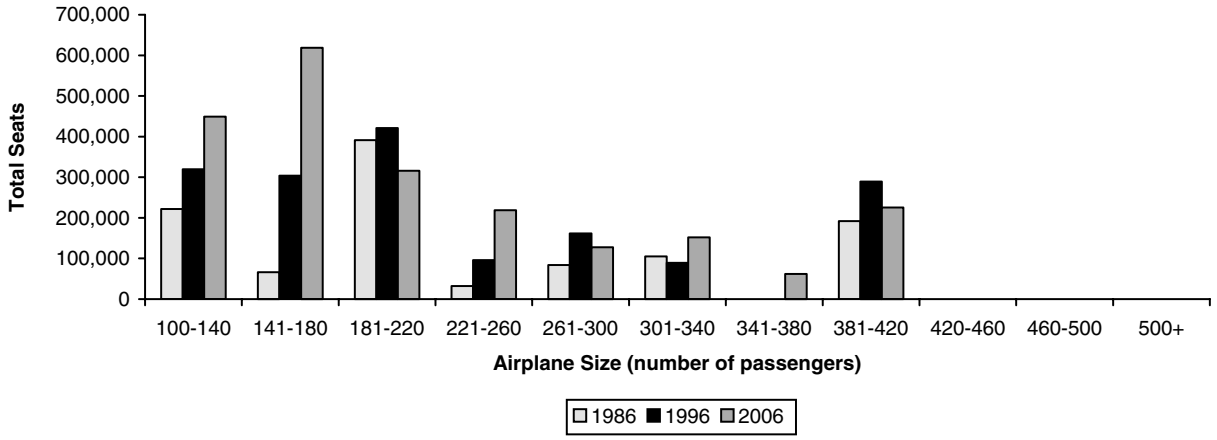
Airline networks, and their approach to those route structures, differ dramatically among carriers. Over time, as new aircraft capabilities have evolved, including a wider span of choices for aircraft size and greater range capabilities, airlines have taken advantage of a broader set of options for their fleets, while at the same time simplifying their aircraft mix in order to reduce costs of complexity (e.g., training, maintenance). This means that a manufacturer that can provide broader range/payload options, but preserve commonality across platforms, should win.

Exhibit 3 shows the distribution of global mainline (above 100 seats) aircraft fleets over the last 20 years, by the total number of seats in active service. The exhibit illustrates two key features about how passenger aircraft have evolved. First, with narrowbodies between 100 to 180 seats a major change has taken place over the last 20 years, driving the rapid growth in this part of the fleet from 1986 until 2006. The introduction of the A320 family and the 737-NG family provided range capabilities for narrowbodies that enabled transcontinental flights. This made possible the expansion of low-cost carrier models from essentially regional airlines to national carriers in the United States or Pan-European carriers in Europe.

The second point illustrated by Exhibit 3 is the flattening of the distribution of widebody airplanes. In 1986, the airplanes that airlines used were determined largely by what the manufacturers offered. There were no real options between 200 and 260 seats at that time. The L1011 and A310 were positioned just above 260 seats. But, above these two airplanes the only option below the 747 was the DC-10. Airlines had few choices, which are reflected by the spikes in fleet mix at that time. When one looks at the current

fleet, however, the picture above 200 seats has flattened considerably, with airlines able to choose nearly any size airplane depending on their network needs. The complete void between 340 and 410 seats is now being filled by the 777-300ER and the A340-600. An estimate that only considered replacement of airplanes with their own kind would have missed the potential for airplanes to change their fleet structure with these new airplanes.

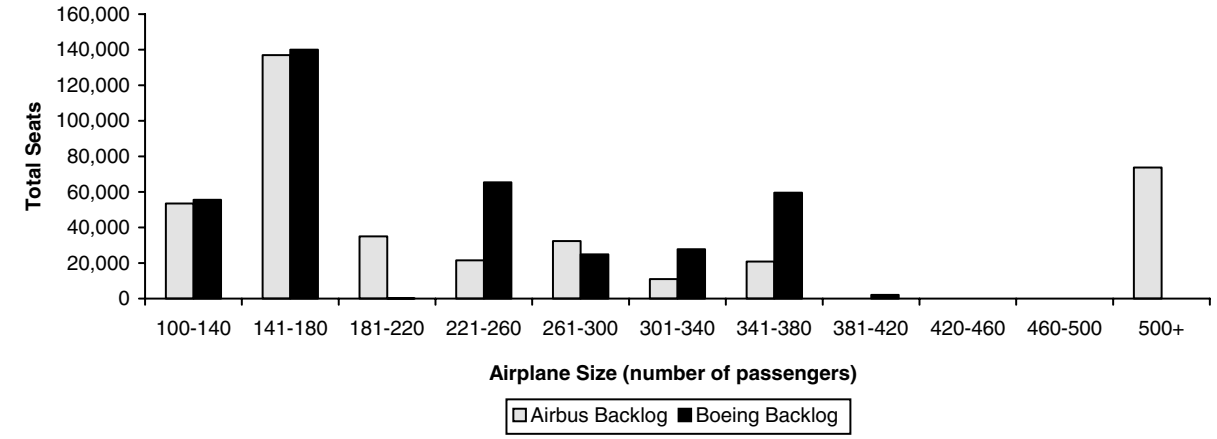
Exhibit 3 Fleet Distribution of Passenger Aircraft Seats by Number of Passengers



Source: Airclaims, aircraft manufacturers and Bernstein analysis.

Now as we look ahead, we expect airlines to seek different fleet mixes that reflect the needs of their networks and their chosen strategies. Exhibit 4 shows the distribution of the current backlog. The distribution has now flattened from 220 to 380 seats, reflecting airlines' ability to take advantage of many different range-payload options. There are still two major voids: between 185 and 220 seats (between the A321 and 787-8) and between 370 and 450 seats (between the 777-300ER and the A380).

Exhibit 4 Backlog Distribution of Passenger Aircraft Seats by Number of Passengers



Source: Airclaims, corporate reports and Bernstein analysis.

The 747-8 is attempting to address demand above 370 seats. We believe there should be demand for the right product in this space, although we are not convinced the 747-8 is that product (it should be attractive for freight, but we have not yet seen the demand for passenger use). The 185-220 seat range also could prove interesting as airlines explore new strategies. One of the most innovative strategies has been Continental's use of 757s with winglets to fly nonstop on narrow transatlantic routes (e.g., Newark-Edinburgh) with high yields. Continental's strategy also takes advantage of the unique characteristics of its Newark airport position, but there is no airplane currently in production that is well-suited for this role.

The message here is that airlines will take advantage of products that provide expanded range/payload capabilities, but this needs to be done without destroying fleet commonality. We believe there should be opportunities on both the high and low end for widebodies and that an ideal product strategy would have offerings covering the full spectrum. Having substantial gaps in a product line when the competitor has products within those gaps may mean losing a customer that seeks to optimize its route structure using those range/payload choices. This is the risk Airbus faces now.

Airbus Has Handed Its Commonality Advantage to Boeing

As airlines look at a broader set of range/payload choices, they need to do so without increasing fleet complexity. This is why commonality across platforms is so important, in our view.

Airbus led the move to commonality across platforms (e.g., flight decks, maintenance, etc.). Airbus was able to plausibly argue that an airline could reduce training and maintenance requirements by using Airbus products from the A320 family, all the way up to the A380. Airbus has also heavily promoted mixed-fleet flying, which allows a pilot to switch between aircraft if they are sufficiently common (while very attractive in principle, it has not been widely adopted).

Starting from scratch, Airbus had the advantage of being able to design a coherent product line with flight deck and parts commonality, whereas Boeing was saddled with legacy platforms that had little in common. Now that Airbus has let its competitive position in the midsize and large widebody segments fall behind, Boeing has emerged as the leader in commonality by emphasizing the same themes that Airbus pioneered, as Boeing works to minimize differences in training time between a 787 and 777 (projected to be five days). Today, even with flight deck and maintenance commonality, Airbus now lacks competitive positions in such a large portion of the product range (200-450 seats) that the value of commonality is lost.

At this stage, Boeing has a strong lead in widebody commonality, with a large number of leading airlines operating 777s or having already ordered 777s or 787s. Airbus had hoped to leverage its installed base of A330s, but six of the seven largest operators of A330s also fly 777s. The one that does not, Northwest, has already ordered the 787. Exhibit 5 shows the alignment of the widebody installed base with Boeing and Airbus, showing that Boeing now has a substantial lead (overall 36.4% versus 18.5% for Airbus). Alignment is determined by products with broad commonality (the 777 or 787 for Boeing and A330, A340, A350 for Airbus). We do not include older products (767, A300, A310) or the more unique very large airplanes (747, A380) as defining commonality. Boeing's lead is growing steadily with the success of the 787, although Airbus is still likely to have the advantage with some of its core A330/A340 operators (e.g., Swiss, TAM, SAS, TAP). We do

not, however, expect that Airbus's commonality link alone will be sufficient to generate a significant level of A350 sales.

Exhibit 5 Alignment of Widebody Installed Base — Size of Passenger Fleet Based on Carrier Alignment by Region

	North America	Europe	Asia	Australia-Pacific	Middle East	Latin America	Africa	Total	Share
Airbus	34	292	63	7	62	47	42	547	18.5%
Boeing	430	161	343	20	79	18	22	1,073	36.4
Mixed	117	132	508	72	103	0	16	948	32.1
Unaligned	34	171	79	9	44	15	30	382	12.9
Total	615	756	993	108	288	80	110	2,950	100.0%

Source: Airclaims and Bernstein analysis.

The A350XWB — Not Yet the Answer

With the launch of the A350XWB, Airbus is attempting to address both the midsize and large widebody markets with a single product. We are concerned about the positioning of this new airplane. Our view is that, assuming Boeing does not stumble on the 787, Airbus has now missed this cycle for midsize widebodies and needs to reconsider positioning for the next cycle. Airbus's plan for the A350XWB is shown in Exhibit 6 (we expect the 2012 target to be optimistic, based on past performance and the commitments of key suppliers to the 787).

Exhibit 6 Airbus Plan for A350XWB

	No. of Seats	Range (miles)	Year in Service
A350-800	270	8,500	2013
A350-900	314	8,500	2012
A350-1000	350	8,500	2014

Source: Airbus.

A major change in design with the A350XWB was a wide fuselage, which is now three inches wider than the 787's. The new cross-section will enable nine-abreast seating in coach, as does the 787. The change was sought by some customers (e.g., Emirates, Singapore), but we are not convinced it was necessary for many customers (see our April 17, 2006, *Research Call*, "BA, EADS: Airbus and Boeing Options Related to the Widebody Product Gap – Updating Our EADS Outlook"), particularly if the airplane should pay an aerodynamic penalty.

Airbus is increasing the speed on the A350XWB to make it equivalent to the 787, at Mach 0.85. In addition, the range has been extended on all of the new A350s, to 8,500 nautical miles. The new range value is roughly equivalent to Boeing's promised 787 values of 8,000-8,500 nautical miles on the 787-8 and 8,600-8,800 miles on the 787-9 (we note that Airbus's comparisons use lower values for Boeing at 7,800 and 8,500 nautical miles).

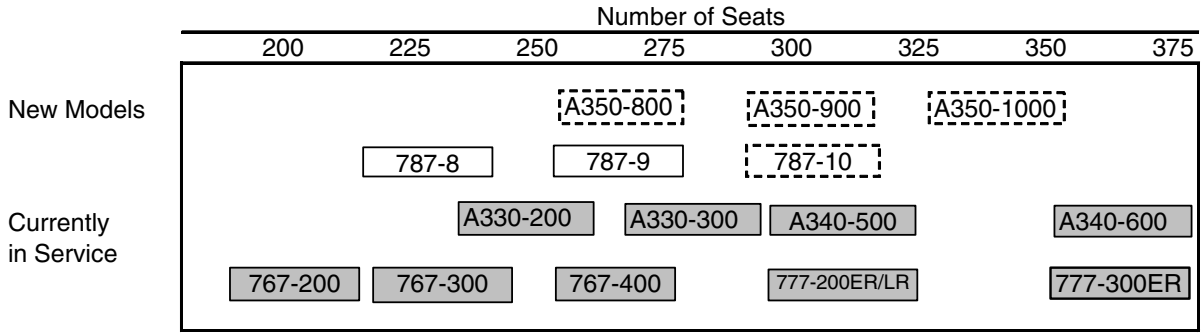
In addition to the wider fuselage and speed needed to compete with Boeing's 787, the new A350 also promises higher cabin pressure (effective altitude below 6,000 feet), higher humidity and 10% lower airframe maintenance than the previous A350. Boeing intends to achieve these objectives on the 787 with a composite fuselage that will not be subject to structural fatigue or corrosion. As Airbus currently plans to use an aluminum-lithium fuselage, it will be important to understand how the A350 will reach these goals. Typically, it is difficult to operate metal fuselages at higher cabin pressure because fatigue shortens the structural lifetime of the airplane. We

note that, while composites should not be subject to the same type of fatigue and promise better performance, we still will need to see the proof in service.

Airbus: Heading Toward an Incomplete Product Line?

The new A350XWB design, announced at the Farnborough Air Show, is intended to cover the range from 270 seats through 350 seats, with range set at 8,500 nautical miles, which is roughly in line with the 787's range performance. The seat counts for the midsize and large widebodies are shown in Exhibit 7. Singapore has ordered the A350-900 with performance guarantees. If the airplane delivers against the performance numbers laid out at Farnborough, it will be an attractive airplane, in our view. We have not yet seen enough detail, however, to understand the basis for achieving these performance levels. But, even if this is an attractive single airplane, the family creates problems for Airbus's long-term product portfolio.

Exhibit 7 Airbus and Boeing: Widebodies by Approximate Seat Count[1]



1 Assumes three classes of service; values vary by configuration; estimates based on manufacturer values; dotted lines indicate airplanes not yet launched; shaded boxes are for models currently in service.

Source: Aircraims, corporate reports and Bernstein estimates and analysis.

If Airbus places the new A350 family in the 270-350 seat range, straddling Boeing's and Airbus's midsize and large widebody segments, the company risks locking itself into an incomplete product line. Over the long term, the markets above and below this airplane may be too small to enable the later introduction of a totally new airplane family. Yet, we do not believe this airplane could be extended any further in either direction. On the high end, we are even skeptical that the airplane as currently described will go all the way to 350 seats with three classes of service, so that the 777-300ER will remain well positioned above it.

An incomplete product line for Airbus would leave gaps that Boeing is able to fill. Boeing, with the 787 and 777, would then better enable airlines that want to have flexible business models across most of the range/payload space. The 777 and 787 should have substantial flight deck commonality, although there will be only limited maintenance commonality, given the substantial structural characteristics of the two airplanes. The new A350 will also have limited maintenance commonality, now that it has evolved into a totally new airplane.

New Single-Aisle Strategy — One Possible Solution

The one option that we see for Airbus to fill its product line below an A350 family, that includes the A350-800, would be a significant modification of its past single-aisle strategy. If Airbus were to introduce an airplane that addressed both the A321 market with greater range and extended up to the 230-240 seat size, it could potentially address the problem of a product portfolio gap over the long term. Such an airplane, however, crosses the boundary between traditional single-aisle and twin-aisle designs. The design challenge would be to deliver strong performance across this space with one airplane family.

A Coming Supplier Squeeze?

We are in a new world of aircraft development, where supplier involvement in development and risk-sharing is the norm. The A380 involved substantial supplier risk-sharing, while the 787 has taken supplier involvement to a new level, with approximately half of the development outsourced. Key elements of design, the fuselage structure and much of the fuselage integration are being done by four suppliers: Spirit, Alenia, Kawasaki and Vought. The wing design and integration is being performed by Mitsubishi and Fuji. Collectively, these companies represent the major part of the global supplier capacity for aerostructures work. Despite questions about whether or not Boeing will operate two assembly lines, we see it as irrelevant in the broader economics for the 787 — with final assembly targeted at three days, most of the critical work will be happening at supplier sites.

The success of the 787 program in the market, as the strongest new aircraft launch ever, means that delivering on the 787 is the highest priority for these companies. Furthermore, Boeing's desire to ramp up volume in 2011 (see below, including Exhibits 8 and 9) places even more stress on supplier performance. Suppliers have had to develop plans for moving to fourteen 787s per month, which is a challenge not only for aerostructure suppliers, but across the board (including suppliers of materials such as titanium). This situation has significant implications for Airbus.

Exhibit 8 Midsize Twin-Aisle Airplanes[1] by Age Group (Global Fleet, Projected in 2011)

	Airplanes in 2011 Aged		
	> 20 Years	> 15 Years	> 10 Years
767	315	543	764
A330	0	50	205
A300/310	204	306	320
Total	519	899	1,289

1 In-service passenger airplanes only.

Source: Airclaims and Bernstein analysis.

Exhibit 9 Fleet Replacement Time by 787 Production Rate, Beginning in 2011 (Based on Age Group in 2011)

Production Rate Monthly	> 20 Years	> 15 Years	> 10 Years
16	1.68	3.74	5.86
14	1.92	4.28	6.70
12	2.24	4.99	7.82
10	2.69	5.99	9.38

Source: Airclaims and Bernstein analysis.

If Airbus intends to also have suppliers develop major portions of the new A350, it is unclear that the aerostructure suppliers for the 787 will have either the financial or operational capacity to become risk-sharing development partners within the next two to three years. Instead, many may look to take items off of their plates in the absence of highly attractive contracts, rather than add (Kawasaki recently announced it would stop its production of A321 panels). We expect suppliers in areas besides aerostructures will also have difficulties during the ramp-up, including titanium suppliers. We doubt any supplier would want to put their 787 performance

at risk, given that the trajectory looks so strong at present. With a ramp-up in volume expected through 2011 and a series of variants (787-8, 787-3, 787-9, 787-10), we expect many of the suppliers' abilities to actively participate in the A350 will be limited going out to 2010. For this reason, we expect that the dates for entry into service of the A350XWB are on the optimistic side.

A350XWB Performance Projections Not Yet Convincing

The A350XWB, as currently defined, is promised to have superior cost performance on a seat-mile basis to the 787. But, Airbus's comparison is done by matching the 787-8 with the A350-800 and 787-9 with the A350-900. Airbus expects an 8% per seat cost advantage for the A350-800 over the 787-8 and a 7% per seat cost advantage for the A350-900 over the 787-9. This is the wrong comparison, as the A350-800 is of comparable size with the 787-9. Even when Airbus's own numbers are used, the A350-800 loses on a seat-mile basis to the 787-9. To have demonstrably better cost performance than the 787 requires that the airplane have more efficient engines, lower weight and/or better aerodynamics. Since the A350 appears to be staying with an aluminum-lithium fuselage, we expect that its weight will be slightly higher than that of the 787. We expect no advantage on engines, as they will be virtually the same as the 787's (i.e., GEnx or Trent 1000 variants). Airbus may be successful on aerodynamics, although that remains to be seen, given the slightly wider cross-section that Airbus is proposing.

Airbus has introduced multiple versions of the A350 over the last two years. In each case, the airplane was billed to have better performance than the 787, with the numbers fairly close to those used for the new A350-800 and A350-900. We believe that most customers did not find the earlier comparisons with the 787 believable. In addition, Airbus continued to change the design, which led some customers to have little confidence in competitive negotiations involving the 787. This time Airbus needs to ensure that it can deliver on the performance it describes in order to ensure credibility. We expect customer performance guarantees to be demanding on this new airplane.

Adjusting the Airbus Strategy — The Need to Move to a Larger Airplane

We expect that there will be significant adjustments to the A350 with Airbus's new CEO, Christian Streiff, at the helm, some of which could be fundamental. Although the fuselage is planned to be aluminum-lithium, our understanding is that composite options are still being considered.

Our preference would be to see the A350 move slightly larger in size in order to make it primarily a competitor to the 777. The 777 is an older-technology airplane than the 787, hence easier for Airbus to surpass in performance. The fact that Boeing is receiving interest in a 787-10 derivative suggests a desire for an airplane with improved performance relative to the 777-200ER. It is also not yet clear how Boeing's 787-10 would perform. As a stretch from the 787-9, it may not be able to deliver the range desired by some carriers.

With the demise of the A340, an entry in this portion of the market should help Airbus deliver on airlines' desires to have capabilities across the range/payload spectrum. The A330 remains a solid current-technology airplane and can be sold to carriers desiring near-term capacity, even if pricing is done at a discount (but not good for margins). A subsequent model could be introduced at a later date to fill the A330 space as a next-generation airplane.

The 787 Controls the Next-Generation Midsize Market

The smallest of the A350XWBs will likely not be a strong competitor to the 787, given that it would come out three years later than the 787-9 and that by then, much of the demand would be taken by the 787. As described above, even Airbus's own numbers do not portray the A350-800 as superior to the 787-9 in terms of operating cost. As Exhibits 8 and 9 show, at the production rates planned by Boeing in 2011 for the 787 (14-16 per month), Boeing will have delivered enough airplanes to account for the entire replacement demand for midsize widebodies before Airbus would have delivered any of its A350-800s. Although the numbers in these exhibits understate the total demand level, because it does not include growth, the demand level is an indicator of the difficulties that Airbus has in trying to compete in the midsize segment with a plane that will likely be undifferentiated at this point in the cycle.

Although Airbus has received 100 orders for its earlier version of the A350, it is not a strong customer list when compared with Boeing's 787 order book (see Exhibit 10). With the A350-800 now unlikely to appear before 2013 (originally, deliveries were to be in 2010), we expect a number of these orders to fall away, either because of the delivery delay or because the newer airplane is too large for these customers' needs. Although Airbus has the commonality advantage with some of these airlines (e.g., TAP, TAM, Finnair, US Airways), this was not sufficient to prevent other Airbus carriers from moving to Boeing with the 787 (e.g., formerly all-Airbus customers, Northwest Airlines and Air Canada). At this point, with the A350XWB announcement, Airbus has set itself on a course where the midsize widebody market may have to wait for the next cycle and discounted A330s may be the best solution in the interim.

EADS management has said that Airbus may be forced to pay penalties to carriers that have ordered the A350, but may not want the new airplane. Despite this potential hit to 2006 earnings, we do not believe Airbus should constrain its long-term strategy by trying to preserve these orders.

Going After the 777 — The Market Opportunity

We see a strategy of attacking the 777 directly as the optimal course, given that the 777 is an older-technology airplane than the 787. Competing against the 777, with the A350's two larger models, should help Airbus bring in next-generation performance. By 2014, when the largest model (350 seats) should be in service, 777 replacement demand will be just beginning. Exhibit 11 shows the profile of the 777s that will be 10 years old or older by 2014. Although the 777 fleet will still be relatively young at that point, if the new A350s can deliver differentiated performance, Airbus could begin to gain in this market over the long term.

We expect, however, that there will be substantial demand for larger airplanes that will not move all the way to an A380. Currently Airbus has no competitive product to address this market, which is owned by the 777 (and at the higher end by an aging 747 platform with little commonality to the broader fleet). The real opportunity remains replacement of older 747s (see Exhibit 12). With a larger airplane, so that the current A350-900 is the smallest of the new product family, Airbus should be able to introduce a strong competitor for the large widebody market.

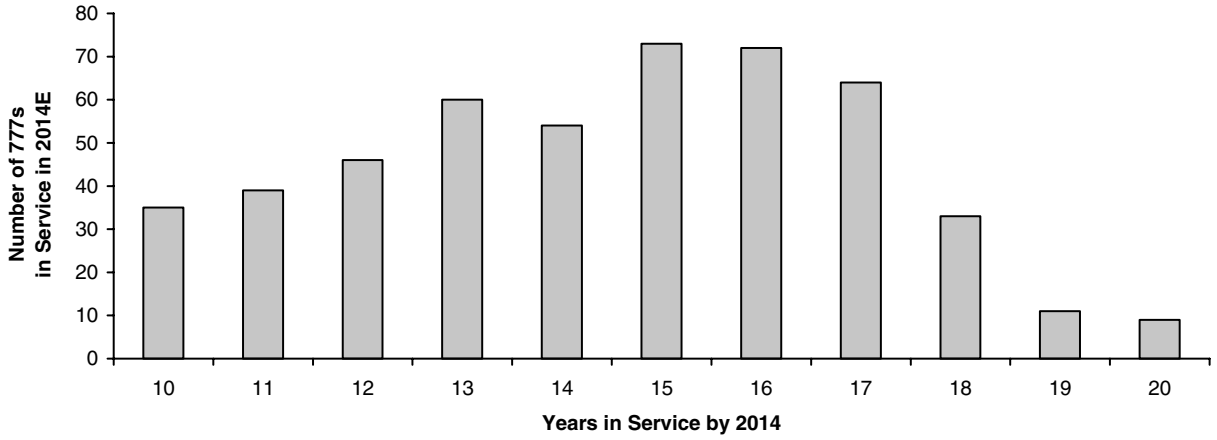
Exhibit 10 Orders to Date for 787 and A350

Airline	787 Orders
ANA	50
Qantas	45
JAL	30
Air India	27
ILFC	20
Continental	20
Northwest	18
Air China	15
China Eastern	15
Air Canada	14
LCAL	14
China Southern	10
Ethiopian	10
Korean Air	10
Shanghai	9
Hainan	8
LOT	7
First Choice	6
Kenya	6
Air Pacific	5
Air New Zealand	4
Blue Panorama	4
Icelandair	4
Royal Air Maroc	4
Vietnam Airlines	4
Boeing Business Jet	2
Pegasus Av. Fin.	2
Unidentified	3
Total	366

Airline	A350 Orders
US Airways	20
ILFC	16
ALAFCO	12
Air Europa	10
TAM	10
TAP	10
Finnair	9
CIT	5
Kingfisher	5
Eurofly	3
Total	100

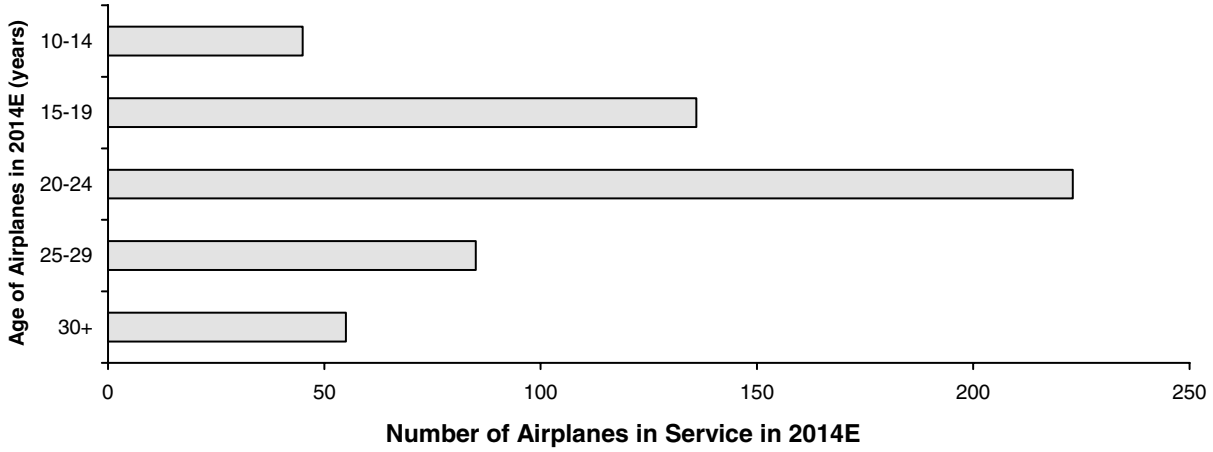
Note: Leasing companies shaded.
Source: Corporate reports.

Exhibit 11 Aging of the 777 Fleet — Replacement Opportunities Begin Near 2015



Source: Airclaims and Bernstein analysis.

Exhibit 12 Age Distribution of Passenger 747s in 2014



Source: Aircraft and Bernstein analysis.

Shifting Up the Airbus Plan

The current Airbus plan is to introduce the A350-900 first, in mid-2012, with the smaller A350-800 following in 2013. The A350-1000 would arrive in 2014, a time that lies outside most airlines' purchasing horizons. We would like to see Airbus skip the A350-800 and focus on an optimal design for the A350-900 and A350-1000, where it might capture the greatest product advantage.

An important factor in the timing of this development program will be the availability of development resources. Airbus is now indicating that a next-generation narrowbody could come as early as 2014. In addition, we expect that Airbus will have a greater challenge in capturing supplier development resources. The timing of the new airplane will likely need to consider both of these factors, in our view.

Airbus claims the greatest advantage in its comparison of the A350-1000 to the 777-300ER (25% lower operating cost per seat-mile). This first makes the assumption that Airbus will be able to extend this family in size to effectively compete with the 777-300ER. We believe this extension will be difficult, if Airbus intends to also deliver its smaller derivative, the A350-800. But, if one assumes that Airbus develops an attractive A350-1000, the older 777 family should be an easier target than the 787 on both weight and aerodynamics. The ultimate performance advantage of the A350-1000 will depend not only on performance characteristics of the aircraft, but also fuel prices. A long-term high-fuel-price environment should make a new, more efficient entry (and a larger airplane) more attractive to airline customers.

The A350-1000 will require a new engine, which should come from Rolls-Royce as an extension of its Trent family (GE will not provide an engine). A new Rolls engine could potentially deliver better performance than the 777's GE90, and Rolls currently lacks an engine in this class. Rolls-Royce has signed a Memorandum of Understanding with Airbus to develop this engine at a 95,000 pound thrust level and Rolls is currently evaluating the business case. We fully expect Rolls to move forward. We note, however, that it does not appear likely that Airbus will be able to deliver two engine options for this airplane with GE out (a long-shot possibility would be an extension of the GP7000, by the Pratt-GE engine alliance). This could be-

come the most significant hurdle in making the airplane attractive to new customers.

One concern Airbus would have in moving to a larger airplane is losing orders for the prior A350 and having to pay penalties. EADS management has already said that it may see penalties associated with the new design. We expect, however, that penalties will be an issue even without a move to a larger airplane. The original A350-800 was to be introduced in 2010. That airplane is now unlikely to arrive until 2013, so that we would expect penalties to be associated with that delay, regardless of the size of the airplane. Orders for the 787 and A350 are shown in Exhibit 10. Finnair and ILFC have publicly supported the new A350 design and Singapore has announced a commitment to order. Other airlines that have thinner international route structures (e.g., US Airways) may be less interested in the A350XWB and we expect this will be true even if Airbus stays with its current plan (rather than moving larger — a wiser move, in our opinion).

Boeing — Getting the 787 Right

The 787 Is the Right Investor Focus — But $500 Million Is Not the Issue

Much concern has been expressed by investors regarding 787 development, after Boeing announced earlier this year that it was increasing its expectations for R&D expense by $500 million, the majority of which would be related to 787 development. Our understanding is that 787 development costs have moved higher at some suppliers as well.

We see investor focus on the 787 program as entirely appropriate, given its importance. If Boeing is able to deliver on the airplane in terms of aircraft performance, new production processes and without any significant delays, the company will be in an extraordinary position with prospects well above our forecasts. Should the program fall substantially short of expectations, it would be the greatest single negative for the company and the stock.

We do not see the company's recent increase in R&D estimates as a significant issue, as we have not seen any indication that the airplane will fall short of performance or be substantially behind schedule. The schedule is particularly important because of the deliveries to China in 2008 for the Beijing Olympics (which is why the "8" in 787). Historically, Boeing's development programs (e.g., 777) tend to be on schedule, with aircraft performance above expectations but usually with cost overruns.

In the end, a $500 million increase (in what we estimate is a $7.5-$8.0 billion investment) will not matter if Boeing gets the airplane right. Furthermore, the margins that Boeing is delivering in Boeing Commercial Airplanes continue to be at peak levels (10%) relative to prior cycles, even though we are not yet at peak volumes and have not yet seen all of the benefits from Boeing's cost-reduction programs. These margins (including the company's above-10% guidance for 2007) happen even with the added R&D expense. We would rather see these margins produced by strong operational performance, which is sustainable, rather than from lower R&D, which is one-time in nature (although, in a perfect world, we would prefer to see both).

Supplier Integration as the Risk, Not the Composites

Our understanding from suppliers is that the real challenge of the 787 is not the composite technology, but the complex supplier management approach. The composite material appears to be well understood and many of the processes are carried over straight from aluminum airplanes. Such processes reduce risk, although they are almost certainly not optimal from a production efficiency standpoint (we would expect to see new approaches that take

greater advantage of the uniqueness of composites on future airplanes, e.g., the single-aisle replacement). We have found it encouraging that what is considered the most radical characteristic of the 787, the composite material, appears relatively minor in the set of issues that concerns suppliers.

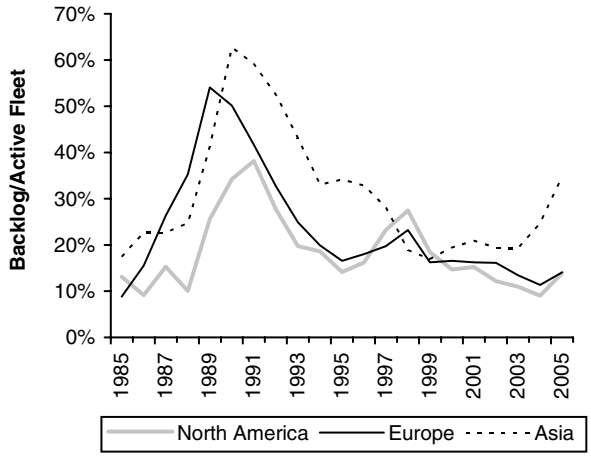
Suppliers point to the challenges of integration and the need to co-invest as the major hurdle. Because suppliers are sharing in the risk, the concern is, "what if I deliver, but one of my counterparts does not?" The weight all falls back to Boeing and its integrated development approach. This is the area to which we have long pointed as the primary challenge, and our more recent discussions indicate that this has not changed. It is also the area that CEO Jim McNerney has identified as top priority.

We find this situation positive because the composite aspects of the airplane appear sound. The challenges regarding integration and supplier processes are much more the classic issues in new product development. Even though those issues are on a greater scale with the 787, we anticipate that Boeing should be able to address them and that we will likely see typical glitches (e.g., need for weight reduction, software issues) as the airplane comes together — not dramatic problems related to structural performance (either in the structure of the airplane or related to damage and repair).

Widebody Demand Continues

Exhibit 13 shows the ratio between the total number of widebodies on order (including cargo) and the size of the active fleet for the three major regions at the end of 2005. North America and Europe remain low by historical standards in terms of renewing and growing their fleets (which could occur at a higher-than-historical rate if high fuel prices persist). We have excluded unplaced lessor orders in this analysis, but it does not change the result, as the lessor impact was higher in the past.

Exhibit 13 Widebody Orders Remain Low by Historical Standards in North America and Europe



Note: Excludes leasing companies.

Source: Airclaims and Bernstein analysis.

If we move out to 2011 and look at the profile of the widebody fleet, it is aging in Europe and North America, but has been aggressively renewed and grown in Asia and the Middle East (see Exhibit 14). Despite the fact that Asia continues to grow, the coming renewal and growth of fleets in

North America and Europe should be good for both Airbus and Boeing, in our opinion.

Exhibit 14 Distribution of Widebody Passenger Fleets by Age in 2011

Widebody Fleet Age in 2011:	< 5	5-9	10-14	15-19	20+	Total
Africa	28	32	24	21	40	145
Asia-Pacific – Developed	248	172	158	149	139	866
Asia-Pacific – Emerging	271	70	149	153	92	735
Europe – Developed	116	150	234	136	126	762
Europe – Emerging	24	5	16	38	102	185
Latin America & Caribbean	31	10	22	28	20	111
Middle East	156	83	84	51	83	457
North America	136	61	250	106	206	759
Undisclosed	24					24
Total World	1,034	583	937	682	808	4,044

Source: Airclaims and Bernstein estimates and analysis.

Exhibit 14 does not include freighters, which are also aging rapidly. For short-haul routes, older, less efficient airplanes are acceptable because utilization (hence, variable cost) tends to be low. For long-haul routes (e.g., those using 747s) utilization is generally high, so that there is an incentive to replace older airplanes, particularly with current high fuel prices.

In developed Europe, more than half of the aging widebody are 747s, while in the United States, more than half are 767s. There remain a large number of aging aircraft in emerging Europe, including Russian aircraft (e.g., Ilyushin-86). The distribution of airplanes that will be more than 20 years old by airline is shown for North America and Europe in Exhibits 15 and 16, respectively.

Exhibit 15 Older (20+ Years in 2011) North American Widebodies by Type and Operator

Operator	A300	A310	DC-10	747	767	Other Widebodies	Total
American Airlines	30				33		63
Delta Air Lines					33		33
Air Canada					29		29
Northwest Airlines			13	13			26
United Airlines				10	4		14
Air Transat		10					10
US Airways					9		9
Omni Air International			8				8
ATA Airlines						4	4
Other			1	1	5	3	10
Total	30	10	22	24	113	7	206

Source: Airclaims and Bernstein estimates and analysis.

Exhibit 16 Older (20+ Years in 2011) Developed European Widebodies by Type and Operator

Operator	A300	A310	747	767	Other Widebodies	Total
British Airways			20	8		28
Lufthansa	12		16			28
Air France			11			11
Excel Airways			3	4		7
Air Plus Cornet		2	4			6
KLM Royal Dutch Airlines			4			4
Monarch Airlines	4					4
Thomsonfly				4		4
Other	1	5	10	13	5	34
Total	17	7	68	29	5	126

Source: Airclaims and Bernstein estimates and analysis.

In summary, we see the widebody market as continuing to deliver growth in both the midsize and large segments. Boeing is currently much better positioned, with the 787 leading the midsize segment and the 777 leading the large segment. Airbus will likely have difficulty attacking the 787 at this stage, particularly with an airplane that attempts to straddle both segments. Long term, we believe Airbus has the best chance to reestablish itself by going up against the older 777, which implies centering the A350 on a larger airplane than currently planned.

Part II: Narrowbodies, Airbus's Lead and the Boeing Threat

Airbus holds an advantage over Boeing in narrowbodies, with leadership in the installed base, which typically translates into orders as airlines seek commonality in their narrowbody fleets. Today, however, competing for market share on narrowbodies will be less important than driving improved margins, as both companies have constrained capacity. We see Airbus and Boeing products as comparable, with the most notable difference being the presence of the A321, which has broadened the attractiveness of the A320 family.

We expect to see next-generation narrowbodies enter service in the 2013-14 time frame, with products ideally covering the spectrum from 90 to 210 seats and requiring two airplanes. As airlines seek flexible capabilities with commonality from their fleets, we believe that the company which provides a broader set of range/payload options will likely win. When next-generation technology arrives, it should unlock relationships previously tied to the installed base, as it did with the 737-NG and A320. Coverage of this broad market space cannot be done with a single airplane. One important wild card, however, will be engines: The timing needs to be aligned with the timing of new engine development.

Boeing's partnership structure on the 787, particularly with Japan, may enable it to move into a strong leadership position on the next-generation narrowbody. Boeing has the advantages of being able to complete its 787 well ahead of Airbus's A350 and to leverage its 787 composite technology. Boeing's greatest threat, however, is likely to be the ability to leverage its broad set of supplier partners to defray the cost of developing the necessary two airplanes. Japan, with its three heavy industry companies now having experience in most aspects of new aircraft development, can offer the greatest level of participation, including taking the lead from Boeing on development of one of the two airplanes.

We expect to see a next wave of narrowbody demand as North American and European legacy carriers renew their fleets. Orders from Asian and Middle Eastern carriers have been strong. But, by 2011, without replacement, there will be 1,984 passenger narrowbodies over 20 years old in North America and Western Europe — well above the number currently on order. This is before adding high replacement needs from Eastern Europe, Latin America and Africa. Orders are typically predicated on a year of profitability coming out of the downcycle, which means that most European carriers are currently positioned to order and U.S. carriers should be ready to order in 2007.

The largest single source of Western narrowbody replacement demand will be replacement of MD-80s. While MD-80s (like DC-9s at Northwest) have negligible ownership cost today, are reliable and have relatively low maintenance costs, we expect to see replacement orders start within the next 18 months because of the sheer size of the replacement requirement at major airlines. With replacement rates limited to roughly three per month due to operational constraints, replacement will take years (at American

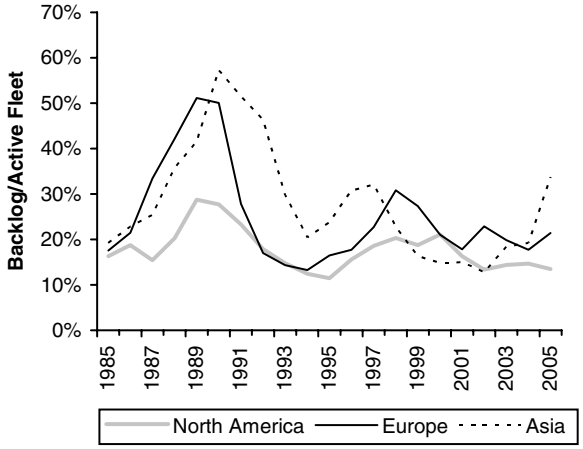
approximately 10 years). Additional replacement will be required for DC-9s, as well as early 737s and 757s.

The Next Wave of Orders — Waiting for the Legacy Carriers

Order Backlogs Remain Below Historical Levels in North America and Europe

We have seen a record number of narrowbody orders during the past 18 months. Nevertheless, the number of orders in backlog remains below historical levels relative to the size of the fleet in both North America and Europe. The ratio of the backlog-to-active fleet size is shown in Exhibit 17. Even though Asia has shown strong order growth, we have not yet seen high levels of narrowbody orders in North America or Europe, despite a substantial number of orders placed by low-cost carriers.

Exhibit 17 Narrowbody Ratio of Backlog-to-Active Fleet — Passenger Only



Note: Excludes unplaced lessor airplanes.

Source: Airclaims and Bernstein analysis.

By 2011, without replacement, there will be approximately 2,000 narrowbody airplanes flying in North America and Western Europe that will be more than 20 years old. This number of aging airplanes in Europe does not include roughly 700 aging airplanes in Eastern Europe and Russia, which will need to be replaced (we don't expect Russian aircraft replacement on a one-to-one basis). Finally, much of the capacity in Africa and Latin America is very old and will need to be addressed at some point. The geographic profile of aging aircraft is shown in Exhibit 18.

Exhibit 18 Narrowbody Aircraft by Age and Region in 2011

Narrowbody Fleet Age in 2011

	< 5	5-9	10-14	15-19	20+	Total
Africa	53	56	65	35	246	455
Asia-Pacific — Developed	91	146	127	91	67	522
Asia-Pacific — Emerging	760	410	381	282	364	2,197
Europe — Developed	636	567	672	340	719	2,934
Europe — Emerging	216	118	173	250	684	1,441
Latin America & Caribbean	214	136	128	107	391	976
Middle East	17	36	56	47	76	232
North America	849	629	1,091	495	1,264	4,328
Undisclosed	131	1				132
Total World	2,967	2,099	2,693	1,647	3,811	13,217

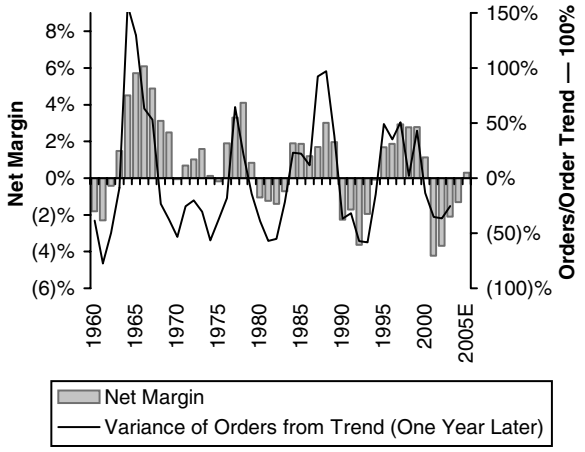
Source: Airclaims and Bernstein estimates and analysis.

North American and European Legacy Carriers — The Replacement Targets

Even though the macro numbers above look promising in terms of narrowbody demand, there remains skepticism among some investors about legacy carriers' willingness to order. This is an important point, because orders at commercially driven carriers typically follow profitability. Exhibit 19 shows global airline profits and orders, lagged by one year, which illustrates the need for profitable performance.

Narrowbody replacement should occur as airlines decide that the projected savings from lower fuel and maintenance costs of new aircraft will more than compensate for purchase cost. But, since narrowbody fleets are often much larger than widebody fleets, it becomes necessary to plan replacement in advance, because airplanes can only be replaced at a rate that does not disrupt operations (e.g., network changes, training requirements). Typically, airlines schedule replacement with timing that avoids costly maintenance procedures.

Exhibit 19 Airline Orders Lag Profitability by One Year



Source: IATA, Airclaims and Bernstein analysis.

We believe that we are set to see the profits necessary to drive aircraft orders. European legacy carriers are already profitable. In the United States, Continental and American are on the edge of profitability. With rising load factors, leading to higher yields, we expect to see substantial airline profits in 2007. (These issues were discussed in detail in our May 10, 2006, *Research Call*, "BA, EADS: Good Times, Bad Times for US Airlines — Recovery in US Aircraft Demand and the Likely Next Collapse".)

Exhibit 20 shows the distribution of passenger narrowbodies in North America that will be more than 20 years old in 2011 by airline. Currently, 254 of American's 354 MD-80s would be over 20 years old. Both American and Delta face issues with their MD-80s and 757s, whereas Northwest has more than 100 even-older DC-9s. There will also be more than four hundred 20+ year-old 737s by 2011.

In Western Europe, the situation is less severe than it is in the United States. However, in Europe there will still be 194 MD-80s, more than 200 737s and 124 A320s over 20 years old by 2011.

Exhibit 20 Older (20+ Years in 2011) North American Narrowbodies by Type and Operator

	A320 Family	737	757	DC-9	MD-80	Other Narrowbodies	Total
American Airlines			51		254		305
Delta Air Lines		22	75		91		188
Northwest Airlines	22		26	104			152
United Airlines		79	49				128
Southwest Airlines		116					116
US Airways	15	97	22				134
Continental Airlines		48					48
Air Canada	24						24
Allegiant Air					16		16
Champion Air						16	16
Spirit Airlines					15		15
Alaska Airlines		1			12		13
Other	4	57	11	4	16	17	109
Total	65	420	234	108	404	33	1,264

Source: Airclaims and Bernstein estimates and analysis.

Will the MD-80s and DC-9s Ever Be Replaced?

Even though Exhibits 20 and 21 show how the age of the North American and European legacy narrowbody fleets, there has been skepticism by some that the aging airplanes will be replaced anytime soon. The MD-80s and DC-9s now have virtually zero ownership cost and they are highly reliable airplanes with relatively low maintenance costs — both because of the quality of the airplanes and the extensive experience that the operators have in working with them.

Exhibit 21 Older (20+ Years in 2011) Western European Narrowbodies by Type and Operator

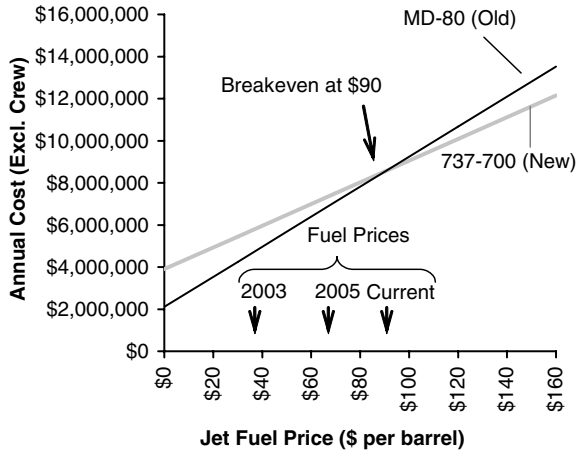
Operator	A320 Family	737	757	MD-80	Other Narrowbodies	Total
Lufthansa	30	56				86
Air France	52	7				59
Alitalia				44		44
SAS				43		43
Iberia	18			24		42
Spanair				31	1	32
British Airways	10	15	4			29
KLM Royal Dutch Airlines		21				21
Cityjet					20	20
dba		10			10	20
Jet2		15	2		1	18
Other	14	97	31	52	111	305
Total	124	221	37	134	143	719

Source: Airclaims and Bernstein estimates and analysis.

The big disadvantage with the MD-80s and DC-9s is their poor fuel efficiency. At their typical utilization levels, around 150 million available seat-miles per year, the MD-80 burns approximately 830,000 gallons more fuel per year than a comparable 737-700. At current fuel prices, this costs an additional $1.8 million per annum. Despite the MD-80's lower ownership costs, we estimate that, at current fuel prices, the 737-700 and MD-80 are approximately equally cost-effective.

Exhibit 22 shows our analysis of operating economics for the two aircraft, suggesting that the MD-80 becomes more expensive to operate than the 737-700 at a jet fuel price of approximately $90 per barrel, slightly below current prices. The precise breakeven point depends on detailed costs; for our analysis, we have relied primarily on DOT/FAA Form 41 data, which are aggregated across multiple airlines.

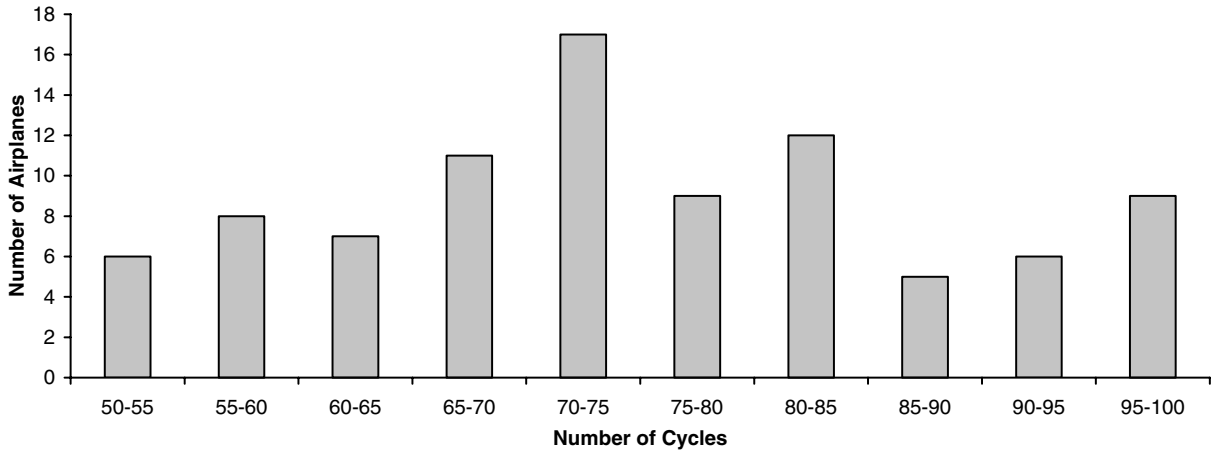
Exhibit 22 Cost Sensitivity to Fuel Price — MD-80 vs. 737-700



Source: DOT/FAA Form 41, *Airline Monitor* and Bernstein analysis.

We see no urgency among the major operators of MD-80s to immediately replace their airplanes. There is certainly the realization, however, that as maintenance costs continue to rise, replacements will need to be done eventually — particularly if fuel prices remain high. The DC-9s, however, do need to be replaced. While Northwest believes that its DC-9s could fly economically for a much longer period of time, there is a requirement for costly modifications at 104,000 cycles (takeoff and landing cycles). As Northwest's fleet approaches this point, we believe the airline will need to make replacements. The profile of Northwest's in-service DC-9s is shown in Exhibit 23 (there are 54 more DC-9s owned by Northwest, but these are in storage). With several airplanes approaching the critical trigger point, we believe Northwest needs to begin upgrading this fleet to a new aircraft type.

Exhibit 23 Northwest's DC-9s by Number of Cycles



Source: Airclaims and Bernstein analysis.

For American and Delta, replacement of their MD-80s will be a major project. Operationally, it is difficult even for these large airlines to replace aircraft at a rate of more than three per month. This is because of the disruption that new aircraft introductions produce in pilot training, route structure, and line maintenance. At these rates, however, it would take American roughly 10 years to replace all of its 354 MD-80s. For this reason, planning needs to begin soon, even if the replacement needs are not urgent.

Holding Out for the Next-Generation Narrowbody? Not Likely

One of the wild cards is the likelihood that new single-aisle airplanes will be launched by Boeing and Airbus during the next two to three years for entry into service in the 2012-14 time frame. Airbus has already said that it could put an A320 replacement in service as early as 2014 (moved up from the earlier date of 2016). Similarly, we believe Boeing is likely to have a new narrowbody in service by the beginning of 2013.

A concern that some have expressed is that the major legacy carriers will hold off on new purchases until the new airplanes are available. We do not expect this to be the case. The legacy carriers are so large that it is not practical to manage capacity around new product introduction dates. American, with a 10-year replacement plan for its MD-80s (not to mention the need to replace 757s), will need to start well before 2013 (a time when

more than 260 of American's MD-80s will be more than 20 years old). We expect to see similar behavior by Delta, Northwest, Lufthansa and United. Before the next-generation airplanes are available, we expect to see the legacy carriers expand the more modern portions of their fleets. For carriers such as American and United that already have large 737-NG and A320 fleets, respectively, operational scale advantages in expanding those fleets further do exist.

Even though carriers are seeking to simplify their fleets, it is inevitable that these large airlines will have two narrowbody fleets of different generations at one time. There is even an advantage to operating the two generations in parallel. Should an airworthiness directive (AD) be issued related to the new airplane, there is the risk of having to ground an entire fleet. Having overlapping generations reduces the AD risk.

For these reasons, we do not expect the North American or European legacy carriers to hold off on updating their fleets until the next generation becomes available. Instead we expect the order decision to be driven by each airlines' profitability (typical ordering begins one year after profits appear) and aircraft operating costs. For Northwest, the costs will appear as the DC-9s approach 100,000 cycles. For American and Delta, the rising costs will likely be when their MD-80s require costly heavy maintenance checks (every five to six years). Due to the large number of these airplanes and the fact that their ages are distributed uniformly (at American from about 14 to 23 years), once a carrier starts replacement, triggered by heavy checks, the replacement cycle would continue for several years.

Therefore, even without the urgency to replace MD-80s in the near term, we expect to see the large carriers begin replacement programs as soon as they have established profitability and they see their MD-80s move into heavy maintenance checks. For U.S. legacy carriers, we expect to see orders begin within the next 18 months.

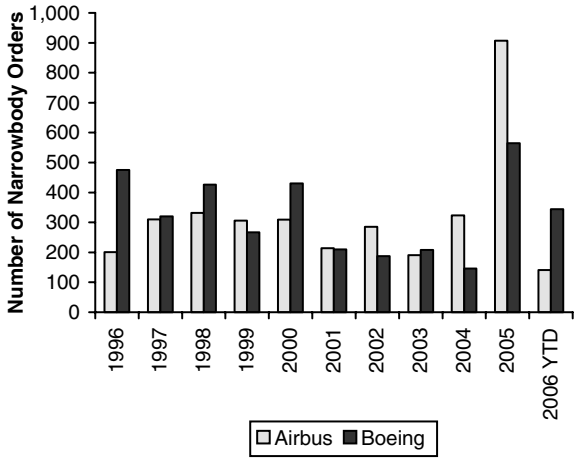
An additional factor that will be important with respect to replacement is fuel pricing. If fuel prices remain near current levels, the incentives to replace older airplanes will rise substantially.

Airbus Holds the Advantage — But Now the Focus Should Be on Margins, Not Market Share

Since 2001, Airbus has generally held the lead in narrowbody orders, with a large portion of its orders coming from new airlines in emerging markets. From 2001 through the first half of 2006, Airbus received 55% of 3,721 narrowbody orders. In the 1990s, Airbus won over some major Boeing customers with the A320 family, including United Airlines and British Airways. More recently, Airbus has been successful at winning deals at Air Berlin and easyJet. The narrowbody orders by year are shown in Exhibit 24, with Airbus leading in four of the five years prior to 2006. In 2006, Boeing has taken the lead, although a good portion of that lead is attributable to the fact that Airbus booked its 150-plane Chinese order in December, whereas Boeing booked its 150-plane Chinese order in February.

In our view, the market share difference should be viewed as largely symbolic. Airbus has a lead, but it is narrow, and both companies have demand that is pushing their capacity limits. The most important issues will be ensuring that pricing in this tight market stays firm, that companies avoid overexpansion and that costs are continually reduced.

Exhibit 24 Airbus and Boeing: Narrowbody Passenger Orders



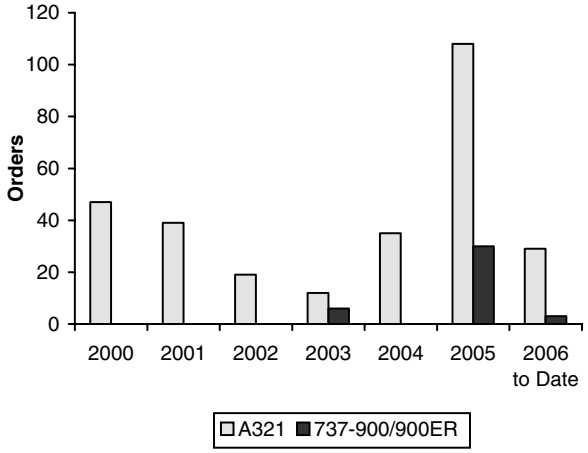
Source: Aircclaims, corporate reports and Bernstein estimates and analysis.

Differentiation between competing narrowbody aircraft is significantly less than that between widebodies. Because of the very different types of demands required on long-haul flights, range/payload and other operating characteristics of widebodies need to be tailored to an airline's network and strategy. In addition, fuel costs are a larger fraction of operating costs on long-haul flights (widebodies) than on typical short-haul narrowbody flights.

We see Airbus and Boeing narrowbodies as very comparable. Both Airbus and Boeing, however, clearly argue for the superiority of their respective products. The A320 family's larger cross-section is attractive to some carriers, which have received favorable customer feedback about the airplane for this reason. In addition, the lighter weight of Boeing's 737 family is a positive factor for fuel economy. On individual products alone, we believe airlines that are neutral based on their installed base would choose whichever manufacturer offered a lower price and/or better deal structure.

The one area where we see Airbus as differentiated on its products is the reach of the family. The A321, at 185 seats, has been a differentiator for Airbus, since Boeing has not had a comparable product (the recent 737-900ER is Boeing's entry into this space). As emphasized in Part I, with respect to a next-generation narrowbody, we believe that manufacturers should work to deliver flexible capabilities for airlines across the range/payload space. Enabling airlines to operate the large A321 and remain common with the rest of their narrowbody fleet has been valuable, and likely has helped Airbus win some deals over the 737. Of the 77 airlines that operate at least 10 A320 family airplanes, 43 of them operate A321s. In addition, some 737-NG carriers have gone to Airbus for the A321 (e.g., SAS, Air Algerie, Royal Air Maroc). Boeing's 737-900 and more recent 737-900ER have not yet proven strong competitors against the A321 (see Exhibit 25). We also believe Airbus has been able to capture higher margins with the A321 because of its differentiation.

Exhibit 25 A321 and 737-900/900ER Orders by Year



Source: Airclaims and Bernstein analysis.

Importance of the Installed Base

Today, however, most airlines have made a decision to operate the 737-NG family or the A320 family. There are substantial cost savings related to having a common fleet. Many point to the obvious benefits of training and maintenance commonality. The biggest benefit, however, comes from reduced operational complexity — as demonstrated by Southwest and Ryanair, for example. We believe the ability to move airplanes and pilots through a network without constraints by aircraft type is substantial.

Exhibit 26 shows the alignment of the narrowbody installed base. Alignment is determined by whether or not a carrier operates 737-NGs (737-600, -700, -800, -900) or A320s (including A318, A319, A321). If a carrier, for example, operates A320s or has them on order (and has no 737-NGs), we define its entire narrowbody fleet as Airbus-aligned because we expect future replacements and additions will be done with Airbus. It is important to note that we do not count older 737s for alignment, since the older 737s lack sufficient commonality with the newer 737-NGs. Airlines that have both 737-NGs and A320 family airplanes are referred to as "mixed". Airlines that have neither 737-NGs or A320s are "unaligned". Unaligned airlines may operate older 737 or MD-80s and tend to be unbiased in their choices between Airbus and Boeing. More than 70% of the fleet is now aligned with either Airbus or Boeing, with Airbus having the lead.

We believe that Exhibit 26 understates Airbus's advantage, because Airbus has a disproportionate fraction of its orders with small or startup airlines (see our June 22, 2006, *Research Call*, "BA, EADS: Perspectives on Commercial Aircraft Demand for Airbus and Boeing — Based on Fleet Age and Geography"). As these airlines inherently do not have large fleets, their growth potential is not reflected in the data shown in Exhibit 26. We believe that there is, however, greater risk in these orders.

Mixed narrowbody fleets are rare outside of China (whereas mixed widebody fleets are common). In China, the unusual relationship between the government and the airlines ensures that the fleets remain mixed, even if there is an economic penalty. In Europe, too, there are a few exceptions such as the split fleet at Air Berlin, SAS's operation of A321s in an otherwise

Boeing narrowbody fleet and Turkish Airlines' split fleet (government-influenced).

Exhibit 26 Alignment of Narrowbody Installed Base — Size of Passenger Fleet Based on Carrier Alignment by Region

	North America	Europe	Asia	Australia-Pacific	Middle East	Latin America	Africa	Total	Share
Airbus	1,314	1,501	455	54	74	212	32	3,642	37.6%
Boeing	1,964	473	508	116	23	188	65	3,337	34.4
Mixed	0	277	254	0	0	0	103	634	6.5
Unaligned	227	859	394	24	86	307	187	2,084	21.5
Total	3,505	3,110	1,611	194	183	707	387	9,697	100.0%

Source: Airclaims and Bernstein analysis.

We expect the Airbus advantage, based on its installed base, to continue during the current generation of products. Airlines that already fly the A320 family will continue buy from Airbus, while the unaligned and mixed markets will most likely split evenly. Nevertheless, Airbus's advantage here is so narrow that both companies should continue to do well, given the strong outlook for narrowbody demand.

Both companies, however, are constrained in their production levels, given the very strong demand. Neither manufacturer wants to risk overexpansion and the potential for the severe ramp-up problems that Boeing faced during the 1990s cycle, or the risk of having built excessive capacity prior to an inevitable cyclical downturn. Our delivery forecasts for Airbus and Boeing are shown in Exhibits 27 and 28, respectively.

Exhibit 27 Bernstein Airbus Delivery Forecast

	2001	2002	2003	2004	2005	2006E	2007E	2008E	2009E	2010E
A300	11	9	8	12	9	10	4	0	0	0
A318	0	0	0	10	9	9	8	8	6	6
A319/320/321	257	237	231	223	276	327	366	375	368	357
A330	35	42	31	47	56	60	58	54	53	50
A350	0	0	0	0	0	0	0	0	0	0
A340	22	16	33	28	21	23	19	15	12	12
A380	0	0	0	0	0	1	9	27	35	40
Narrowbody	257	237	231	233	285	336	374	383	374	363
Widebody	68	67	72	87	86	93	81	69	65	62
A380	0	0	0	0	0	1	9	27	35	40
Total	325	304	303	320	371	430	464	479	474	465

Source: Bernstein analysis.

Exhibit 28 Bernstein Boeing Delivery Forecast

	2001	2002	2003	2004	2005	2006E	2007E	2008E	2009E	2010E
717	49	20	12	12	13	5	0	0	0	0
737	301	221	173	202	212	300	338	354	329	319
757	45	29	14	11	2	0	0	0	0	0
767	40	35	24	9	10	11	11	7	0	0
787	0	0	0	0	0	0	0	25	77	95
777	61	47	39	36	40	72	83	85	85	70
747	31	27	19	15	13	15	15	12	16	24
Narrowbody	395	270	199	225	227	305	338	354	329	319
Widebody	132	109	82	60	63	98	109	129	178	189
Total	527	379	281	285	290	403	447	483	507	508

Source: Bernstein analysis.

Nevertheless, even though the two manufacturers do not want to raise capacity, indications we have received suggest that Airbus has been pricing aggressively on long-term narrowbody deals up until the last six months. We now believe there is increased focus on margins at Airbus and we may see some firming in pricing.

The Next-Generation Single-Aisle Airplane

Why This New Airplane Will Be Critical

Although the installed base is of significant importance, that value vanishes as soon as a next generation of technology is introduced. Boeing thought that it would hold on to its large narrowbody customers at United Airlines and British Airways when it brought out its 737-NG. Suddenly, though, the hook of fleet commonality was gone and the playing field evened. The technology transition was the disruption that these carriers needed to truly make Airbus and Boeing compete with each other for the next narrowbody order. At this time, British Airways and United each made the decision to go with Airbus.

We see three critical factors for the next-generation single-aisle airplane:

- **Opening of the Market.** As we head toward the next-generation narrowbody, we should again see the market open up. Boeing-aligned airlines (e.g., American, Delta) could have the opportunity to go with Airbus, whereas Airbus-aligned airlines (e.g., Northwest, British Airways) could move to Boeing. This means that both companies will have a much broader set of customers to address.
- **Range/Payload Segment Choice.** There will be key decisions on the target market for the new airplane — i.e., should it be larger, smaller or the same size as current products? We think the next single-aisle should address *both* larger and smaller aircraft segments.
- **Technology Choice.** Airbus and Boeing will need to make major choices on materials. Boeing has already indicated that its next narrowbody will be primarily a composite airplane, much like the 787. Airbus has not decided, but appears to be staying with a metal (aluminum-lithium) fuselage for the A350.

Since the market will open up when the new products are announced, the decisions on range/payload and materials will be big bets for Airbus and Boeing. If one of the new airplanes has truly differentiated performance, market shares could easily shift strongly in one direction or the other, unlike today's roughly 50/50 split with a narrow Airbus advantage.

Timing of the Launch

We do not believe either Boeing or Airbus wants to launch the next narrowbody anytime soon. Both companies have worked hard to convince the aircraft finance community that they have no near-term plans to launch a narrowbody airplane in order to protect residual values of current-generation airplanes and to reduce risks to their backlogs.

Airbus had said that the next A320 would not be introduced before 2016. This date has now been moved up to 2014. Boeing has offered no guidance on when the 737-NG replacement would be launched and neither have the engine manufacturers (who are central to the next single-aisle launch). United Airlines and American Airlines have, however, each delayed their A320 and 737 deliveries until 2013, which we see as an indicator for when the next-generation narrowbodies are likely to go into service.

We expect Boeing to move first with a likely launch announcement in 2008 for deliveries in 2012-13. By mid-2008, we expect Boeing engineering capacity would become available from the 787 by mid-2008 and from the 747-8 by mid-2009. At this time, however, Airbus should be in the middle of its A350 program, which could limit its ability to deploy resources against an A320 replacement. If the A400M goes well, that program could liberate some resources in the 2009 time frame. In any case, we think that an A320 replacement and the demands of the A350 program will give Boeing a resource and timing advantage on the next single-aisle product.

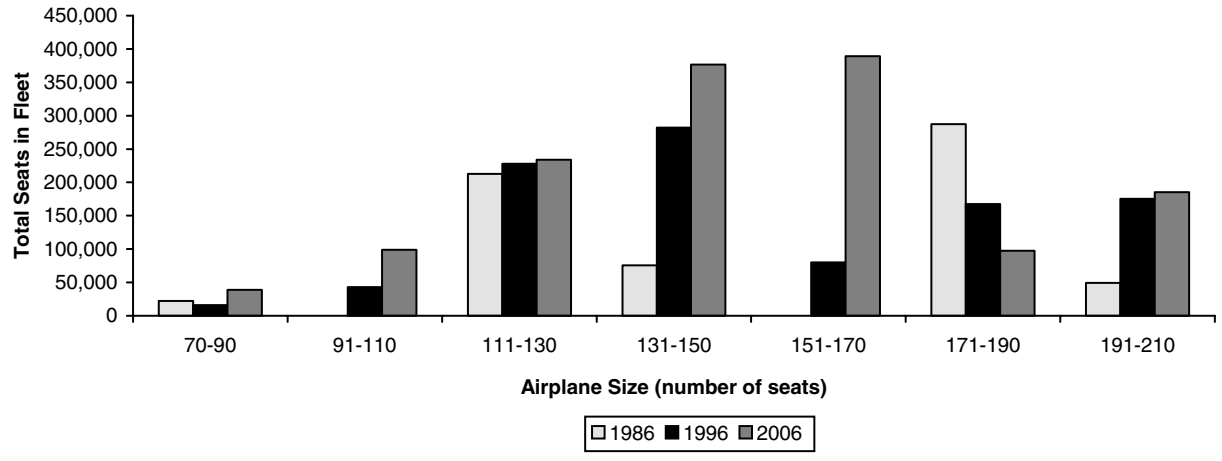
Selecting the Target Market

In Part I, we illustrated the importance of providing flexible capabilities for airlines, rather than attempting to pick the exact range/payload spot for a new aircraft introduction. By our analysis, we have found that airlines have built their strategies around available airplanes rather than effectively influencing manufacturers on what the right product should be. Today, however, the needs of airlines are becoming very diverse, with different carriers using various strategies, including a range of low-cost approaches, charter, long-haul specialists and large network players. The different strategies require more options for equipment, but all want to maximize commonality. Therefore, the manufacturer that can provide the best market coverage with a common platform should be advantaged. As we described above, we believe that the broader market coverage with the A321 has been an advantage for Airbus's A320 family.

Exhibit 29 shows the composition of the global fleet by aircraft size for narrowbodies in 1986, 1996 and today. In 1986, aircraft were predominantly point solutions with airplanes at the 70-90 seat level (BAe-146 100/200 and F-28), 737s and MD-80s from 111 to 150 seats, 727s at 171-190 seats and early 757s at 191-210 seats.

We have seen the fleet grow in every size category over the past 20 years, with the exception of the 171-190 range in which the 727s were retired. In addition, range has increased, enabling airlines like Southwest, JetBlue and Ryanair to fly transcontinental routes, making them much more than just regional carriers.

Exhibit 29 Evolution of the Global Narrowbody Passenger Fleet by Aircraft Size

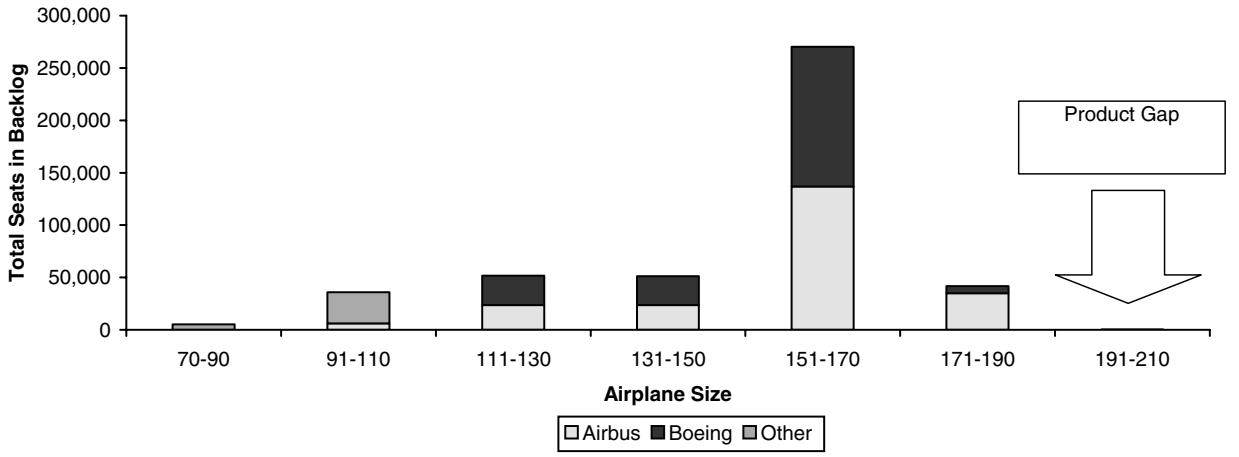


Source: Aircraims and Bernstein analysis.

The widebody backlog today, in terms of seats, is spread evenly over a wide range of aircraft sizes. For narrowbodies, however, the backlog has fallen heavily into the 151-170 seat category that corresponds to the A320 and 737-800 (see Exhibit 30). Demand has also been increasing recently for the larger A321 and is just beginning for the 737-900ER. This trend is not surprising in the upcycle. As demand rises airlines typically seek larger airplanes for increasingly dense routes. By contrast, in downturns smaller airplanes do well (e.g., 50-seat regional jets in 2001-03 — a market which has now virtually disappeared).

The other important point about the backlog in Exhibit 30 is the absence of an airplane above 190 seats. We see this as a major gap. There is no airplane currently in production or planned that is designed in the space between 185 and 215 seats — basically too large for the A321 and too small for the 787-8. In addition, below 110 seats, Boeing and Airbus are not competitive with either the A318 or 737-600. Embraer leads in the market near 100 seats, with Bombardier in a very weak position. In addition, the two emerging market airplanes in development (Russia's RRJ and China's ARJ) lie in this space.

Exhibit 30 Current Global Narrowbody Passenger Backlog



Note: Other includes Embraer, Bombardier and Sukhoi.

Source: Airclaims and Bernstein analysis.

For Boeing and Airbus, we expect their single-aisle strategies to address the full potential range of this market — from 90 to 210 seats. At the low end (i.e., 90-110 seats), the strategy should be for protection against the gradual emergence of a new competitor coming from the bottom up into the mainline jet arena (e.g., Embraer, China's AVIC-I). The impact of Boeing and Airbus entries down to the 90-seat levels is that the strategy would provide downward commonality with the mainline fleet. Today, scope clauses prevent most U.S. carriers (all except JetBlue, Southwest, US Airways and Alaska) from operating aircraft above 70-77 seats with lower-cost, regional pilots. This is slowing the penetration of Embraer's 190. However, we expect these restrictions to be relaxed over time. By the time the next-generation narrowbodies enter the market (i.e., 2012 or later), downward commonality with the mainline fleet could be critical. If Boeing and Airbus attack the 100-seat market, we expect the commonality issue to have a ma-

jor negative impact on Embraer and potential new entrants in the large regional jet market.

At the low end (i.e., 90-110 seats), for Airbus and Boeing this market is about protecting the mainline market. The total dollar value of this segment is relatively small. It is at the high end (170-210 seats) where we see the most valuable opportunity.

At the high end, we believe that airlines will be searching for the ability to pursue routes like Continental is doing today with its range-enhanced 757s — e.g., flying Newark-Edinburgh or Newark-Stockholm nonstop in order to capture premium yields. With the right equipment we expect similar routes to emerge from Europe to smaller North American destinations and from North America to secondary Latin American destinations. In the current generation of aircraft, Airbus is capturing an advantage with its larger A321. But, there is no longer any single-aisle aircraft in production above the 185-seat A321. With slightly more range, we expect this will be an important place to have a single-aisle product.

Developing Two Airplanes? Boeing's Advantage, Japan and Why the 787 Matters

If Boeing and Airbus each try to cover the single-aisle space from 90 to 210 seats, they will need to introduce two airplanes. We doubt that either company alone would be able to make the simultaneous investment in two airplanes, so development would need to be sequenced or else done with a partner. If development were done with a partner the staging could be done close together.

For Airbus we expect the staging of two airplanes will be particularly difficult because Airbus will likely still be developing the A350 at the time when the company would need to be working on the A320 replacement to respond to a likely Boeing narrowbody launch.

Is Japan the Key for Boeing?

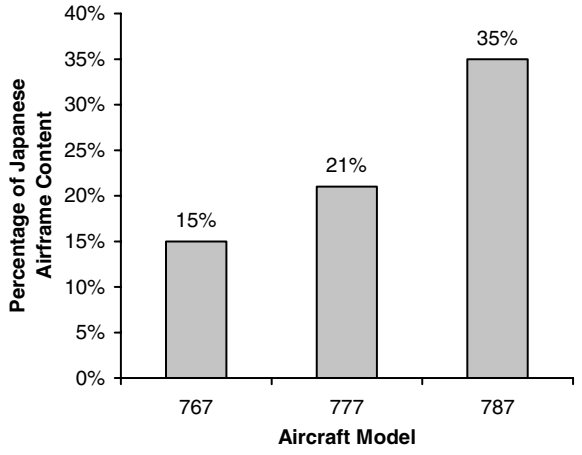
Boeing is in a much better position than Airbus to do parallel development because of its partnerships on the 787. Boeing has said it will use composite technology developed on the 787 for the next-generation single-aisle jet. Through its risk-sharing relationships, Boeing already has deep risk-sharing relationships with the six most prominent independent aerostructure companies in the world: Alenia, Vought, Spirit, Mitsubishi, Kawasaki and Fuji. The scale of Boeing's activities with these suppliers could make it difficult for Airbus to gain desired risk-sharing relationships for the A350, but Boeing's relationship with its Japanese suppliers could make the situation even more difficult for Airbus, when it comes to narrowbodies.

The Japanese Aircraft Development Corporation (JADC) has long sought to expand its role in commercial aircraft. The principal players in the JADC are Mitsubishi Heavy Industries (MHI), Kawasaki Heavy Industries (KHI) and Fuji Heavy Industries (FHI), with smaller levels of participation by Nippi and ShinMaywa Industries. There are also a large number of additional Japanese aerospace suppliers that work with these major players.

During the early 1980s, work began on the 7J7, which was to be a Japan-led follow-on to the 727. This airplane was eventually cancelled. In the 1990s, the JADC proposed launching the YS-X regional jet with Boeing's support, which would have addressed the 90-100 seat range. This program was never launched, although we understand that the JADC has continued to examine possibilities for producing a regional aircraft.

We are now at a point where the experience of the JADC supplier base is substantial and the JADC/Boeing relationship continues to build. Exhibit 31 shows the percentage of airframe content on major Boeing programs; Exhibit 32 shows the suppliers that lead work on different Boeing platforms. As can be seen from these exhibits, Boeing has outsourced increasingly large portions of its development and production work to suppliers. With the 767, 777 and 787, the Japanese companies will have had design responsibility for the major fuselage and wing sections.

Exhibit 31 Percentage of Japanese Airframe Content on Boeing Programs



Source: Boeing and JADC.

Exhibit 32 Leadership of Major Boeing Airframe Activities

	737	767	777	787
Nose Section	Boeing[1]	Boeing[1]	Boeing[1]	Spirit
Center Fuselage	Boeing[1]	KHI	KHI	Alenia/KHI
Aft Fuselage	Boeing[1]	MHI	MHI	Vought
Main Wing Box	Boeing	Boeing	Boeing	MHI
Center Wing Box	Boeing	Boeing	Boeing	FHI

1 Now Spirit AeroSystems.

Note: Shading indicates Japanese lead — KHI (Kawasaki Heavy Industries), FHI (Fuji Heavy Industries) and MHI (Mitsubishi Heavy Industries).

Source: Boeing, Teal and Spirit.

We have no doubt that the JADC now has the capability to take the lead in launching an airplane in the lower end of the single-aisle range. On many occasions, the Japanese have made it clear that they intend to eventually launch their own aircraft. But, the JADC on its own has no basis for marketing an aircraft and would have significant challenges if it could not leverage commonality with another platform.

Now may be the time for Japan, because we believe two airplanes are necessary for the next-generation single-aisle space and Boeing would have difficulty developing both of them together, without financial and engineering support. We believe the right approach would be the Japanese airplane starting between 90 and 100 seats and extending up to between 130 and 140 seats. Then, a larger Boeing airplane could be added to address the 150-210 seat space.

The Boeing-JADC scenario with two airplanes will present a challenge for Airbus. We believe that Boeing's rapid acceleration of the 787 program will help support this narrowbody strategy, as all of the aerostructure suppliers will be consumed with 787 work and have less capacity to support Airbus risk-sharing programs. We note that Kawasaki has already said that it will discontinue production of panels for Airbus's A321, as well as components for Embraer. These actions are consistent with a need to focus on Boeing's 787 and potentially a longer-term lead position on a new single-aisle airplane.

Potential Airbus Responses

If a Boeing/Japan partnership covered the 90-210 seat widebody space, we see three potential approaches for Airbus:

- **Respond With a Single Airplane.** While this approach would reduce investment costs, we believe it would be an unacceptable scenario for Airbus, which is already creating product-line gaps with its plan for the A350. Airlines are now looking for a range of capabilities that allow them to implement tailored strategies. For airlines that are seeking a broader set of capacity options, a single entry in the middle of the narrowbody space likely will be inadequate.
- **Sequentially Introduce Two New Airplanes.** This approach would bound investment levels at a given time and work within likely scarce engineering resources. If the first of these airplanes enters service in 2014 (still a challenge, given A350 development demands), the second would be unlikely to appear until 2018 because we see these as two separate designs. The introduction would be late if Boeing's or a Japanese airplane entered service by 2013, as we expect the second airplane could follow closely.
- **Overlapping Development of Two Airplanes With a Partner.** This approach requires a partner, because we believe it would be impossible to introduce the A350 and two narrowbody airplanes by 2016. Even with extensive financial aid, growing the scale of engineering resources to develop the airplane would be difficult. Each of the potential partners below is imperfect, but with sufficient financial support in Europe and aggressive development of its own design capabilities, we believe this approach could work. The partner(s) would likely supplement Airbus's efforts, rather than take ownership of a complete design. Potential partners for such an effort could include:
  - — Embraer: Challenging, even though Airbus already has an equity stake. Embraer's 190, while an excellent airplane at the 90-seat level, would not be compatible with Airbus's designs and would be threatened by any Airbus entry below 120 seats. Bombardier could be a cleaner option, despite Airbus's position with Embraer. Bombardier's weakness at 90 seats and the failure of the C-Series could make it a more attractive option for a new design.
  - — China: A major focus of Airbus, given its intent to do A320 final assembly there, as well as Airbus's objectives for Chinese participation in the A350. We do not, however, believe that China is sufficiently advanced in aircraft development to play the scale of role that Airbus would likely need to introduce two airplanes.
  - — Russia: Certainly, the technical expertise exists in Russia for modern aircraft development, but production and design for manufacturability likely will be an issue. Despite EADS's recent stake in Irkut and stated intent to place A350 content in Russia, Airbus has been slow to develop a position in Russia either in design or sourcing (other than raw materials).

Each of the above options has weaknesses, but we expect that a combination of EU financial support, combined with at least one of the partners above, will likely be the best approach. As an aside, if the scenario we describe here plays out, we expect WTO conflicts will grow even larger and will come from Europe, the United States and Japan.

Material Decisions

Manufacturers will be choosing between composite and metal materials options for the next narrowbody. Boeing has stated that it will use a composite fuselage, which will directly leverage their 787 experience. Given the close relationship between Boeing and Japanese suppliers, we expect that any Japanese-led airplane would also use a composite fuselage. It is not yet clear which direction Airbus will choose. Airbus is still headed toward an aluminum-lithium fuselage on its A350, which means that a subsequent shift to composites would entail added development cost.

If Boeing goes forward with a composite fuselage and Airbus stays with aluminum-lithium, it could lead to opportunities for significant differentiation between the two airplanes. From a fuel-economy and cabin-comfort standpoint, the materials choice should have less impact on these shorter-haul narrowbodies than on widebodies. Nevertheless, if composites work the way Boeing is expecting, there could be maintenance cost advantages, as well as advantages in production processes.

At this stage, all indications for us are that Boeing's composite progress is going well. Airbus's material choice will be an important one. On one side, the metal fuselage approach may be lower-risk (although aluminum-lithium has its own issues). But if Boeing is able to deliver on its objectives, Airbus could find itself in a weak position if it stays with a metal fuselage. On the other side, should composites not work well for Boeing, Airbus could capture the advantage.

Valuation Methodology

We base valuation of aerospace & defense companies on relative EV/EBITDAP multiples for 2009, discount the 2009 valuation and add discounted cash flows prior to 2009. Our EV/EBITDAP multiple for EADS in 2009 is 5.75x and for Boeing is 7.3x. These multiples for the sector are determined by comparison with historical values over the defense and commercial aircraft cycles.

Risks

The principal risk to our forecasts for EADS and Boeing would be a decline in demand for air travel, which could be caused either by an economic downturn in Asia or a major terrorist event. The impact of potentially higher fuel prices also poses a risk, as higher fuel prices would be a negative for airline profitability, but are also a positive because new, fuel-efficient planes become more attractive. In addition, execution risks remain for new products by both manufacturers (Boeing (787 and 747-8) and Airbus (A380 and A350)). Delays in these programs or performance issues (e.g., weight, noise) could have a significant impact on revenues and margins.

On the defense side for EADS, we see additional risks coming from performance on key developmental defense programs, including the A400M and Meteor. We also see a risk that management uses cash resources for increased investment or a defense acquisition, either of which we believe would be a negative for the stock.

Additional risks for our outperform rating on Boeing are related to the defense portion of its business, including funding and execution risks related to Missile Defense and Future Combat Systems programs.

Investment Conclusion

We rate Boeing outperform with a target price of $101, based on the company's widebody position, a long commercial upcycle and ongoing commercial margin improvement. Although narrowbodies will continue to be a major source of revenue and earnings for Boeing, the company's principal differentiator in the market is currently in widebodies. Long term, however, we see the 787 as having created a structural advantage for Boeing through its supplier agreements, with those in Japan being most important. Even though Boeing trails Airbus slightly on narrowbodies today, Boeing's relationships should give it the ability to move into a strong leadership position for the next-generation narrowbody.

For Boeing, we see recent price declines over concerns surrounding additional R&D expense guidance as a buying opportunity. The fundamental thesis for owning Boeing is still intact and we see little indication that Airbus will be able to recapture lost ground in product development during this demand cycle.

We rate EADS market-perform with a target price of €23. Our EADS rating is attributable to an expectation of solid short-term performance, but long-term issues related to Airbus's widebody position and margin pressure. We expect Airbus to continue to demonstrate strong narrowbody performance. However, long-term margin pressure at Airbus is likely to result from exchange rates as hedges roll off, shortfalls in cost-reduction programs and aggressive pricing on current-generation widebodies.

For Airbus, we believe it is too late to effectively compete for this cycle's midsize widebody demand versus the 787 and that Airbus should instead focus on attacking the 777. Yet, despite Airbus's serious widebody issues, it is important to remember the strength of the company's narrowbody position, which will be the core of EADS's value in the near term. Yet, Boeing's widebody position has the potential to place Airbus's long-term narrowbody position at risk, on account of Boeing's supplier relationships.

The key to the EADS's performance will be the program and team put in place by Airbus's new CEO, Christian Streiff. We would like to see a strong path forward on cost, combined with a clear vision on widebody product development, before becoming more positive on EADS's shares.

Disclosure Appendix

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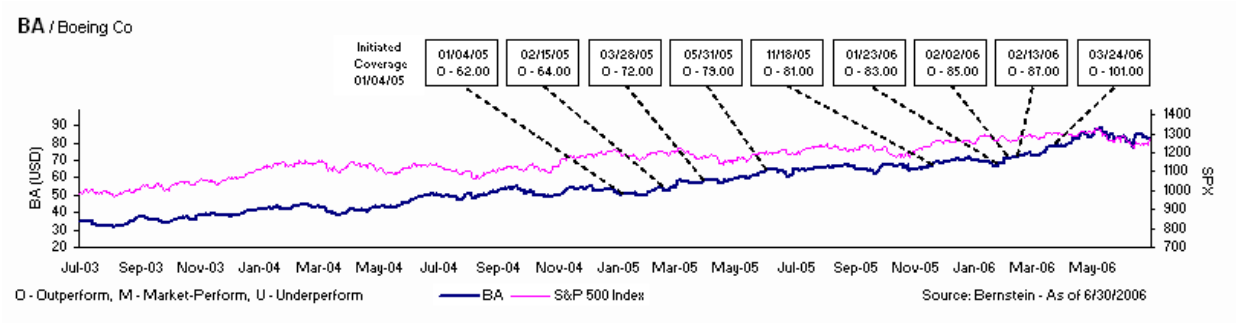

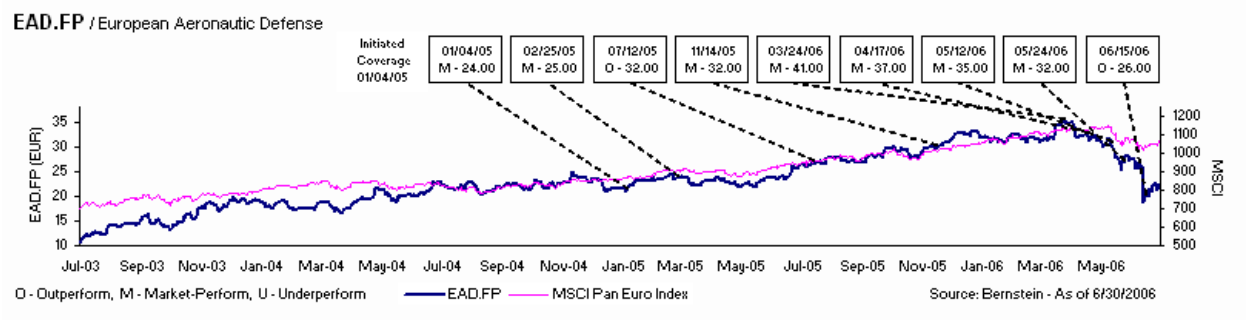

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