Flying further for less

Blended Winglets and their benefits

"Just as the automotive industry has transitioned to radial tires, the aviation industry will upgrade to performance-enhancing Blended Winglet technology," predicts Aviation Partners Boeing (APB) chairman Joe Clark. Here, *APB* explains why, if you haven't already upgraded to Blended Winglet technology, your operating costs are higher than they need to be.

It's not easy changing the global airline industry and the economics of flight. Once an aircraft model is designed it's essentially frozen and you're pretty well stuck with the original performance, range and fuel-burn parameters for the life of your asset. Maximising cost efficiency, particularly for today's low-fare airline carriers, typically comes down to managing external factors — hedging on fuel, maximising labour productivity and fine-tuning assorted operating and service costs. Until relatively recently, there really was not much an operator could do to measurably enhance performance, extend range and reduce fuel-burn on existing aircraft, other than through expensive re-engine projects, such as for the ageing 727 fleet. This all changed, however, with the introduction of Aviation Partners' Blended Winglet technology about 10 years ago.

Designed originally for the Gulfstream II business jet in 1991, the 5.5-foot tall wide-sweep Blended Winglets dramatically extended range and reduced fuel burn up to seven per cent via overall

wing drag reduction. Retrofit fuel savings of this magnitude previously required re-designing the entire aircraft or re-fitting new engines. In 1999 Boeing adopted Blended Winglet technology to boost the range and marketability of its Boeing Business Jet. Soon thereafter Aviation Partners Boeing, a joint venture between Aviation Partners and The Boeing Company, began offering Blended Winglet technology to 737 NG operators, both as retrofits and later as buyer-furnished equipment (BFE). The rest, as they say, is history.

Changing the economics of flight

Today, over 1,000 737 NGs are flying with Aviation Partners' Visible Technology, over 50 per cent of the 737-700/800 fleet is Blended Winglet-equipped and more than 85 per cent of all new 737-700s/800s are factory-delivered with this technology. Operators range from Southwest Airlines and Ryanair, with Blended Winglet orders numbering in the hundreds, to smaller operators in far-flung locations on all continents of the world. Blended Winglet systems are also available for 757-200s and 737-300 Classics with a programme in development for the 767-300.

Aviation Partners' Blended Winglet systems improve the performance of any commercial or business aircraft, says Aviation Partners Boeing chairman Joe Clark: ''People often think of Blended Winglets as only for specific aircraft but that's not true. While we tailor Blended Winglet systems to particular aircraft this technology works on any aircraft, from a smaller regional jet to the Airbus A380.''

The primary driver in the mass migration to Blended Winglets among both operators and leasing companies worldwide is quick payback on investment: typically between two and three years on fuel savings alone. Typical 737 NG operators save 95,000-130,000 gallons of fuel per aircraft per year and these fuel savings benefits stay with the operator for the entire economic life of the aircraft. Operators of Blended Winglet-equipped 757-200s save even more: up to 240,000 gallons per aircraft per year. Along with these significant and ongoing fuel savings come a host of important environmental benefits. A Blended Winglet-equipped 737 reduces

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carbon monoxide and nitrous oxide emissions by 4 per cent and 5 per cent respectively while decreasing the take-off noise footprint by 6.5 per cent. Thanks to improved wing efficiency and reduced noise footprints, many Blended Winglet-equipped operators in Europe have been able to decrease operating fees and noise surcharges by opting for lower-thrust engines and lower max take-off weight.

With fuel costs recently as high as $70 per barrel — and not expected to come down dramatically over the foreseeable future — operators are looking for any tools they can use to remain cost-competitive. "While it's the cost-saving attributes of our technology that have made Blended Winglets a necessity for today's progressive low-cost carriers, it's the fuel savings benefits that I'm most proud of," says Clark. "Blended Winglet fuel savings have totalled over 260 million gallons to date and the industry will save another 120 million gallons this year because of our technology. Assuming we deliver 400 Blended Winglet shipsets per year for the rest of the decade, our technology will save approximately 1.5 billion gallons of jet fuel for the decade 2001-2010. At Aviation Partners we're doing our part in a changing world."

Blended Winglet design

Aviation Partners' Blended Winglets differ in several important ways from the small, angular, wingtip appliances you see on many commercial aircraft today. Blended Winglet technology works as well as it does because the winglet systems are sized for maximum advantage based on available wing structure and are shaped with a patented wide transition chord from wing to winglet to minimise vortex drag. Aviation Partners' chief aerodynamicist Dr Bernie Gratzer created the Blended Winglet back in 1991 by blending the airfoil for maximum performance while ensuring even wing loadings for maximum drag reduction. The end result is a block fuel savings of four to five per cent for 737s and even more for 757-200s, compared to 1-1.5 per cent savings with traditional-style winglets.

Cases studies

Aeromexico, the largest airline in Mexico, has ordered 38 Blended Winglet shipsets for 737-800s and 737-700s. Blended Winglet-equipped 737-800s will be used to replace existing 757-200 routes to the US, including the 1,816nm route from Mexico City to New York. "While 5 per cent block fuel savings were an important benefit to Aeromexico the overriding factor in this purchase decision was the ability to effectively replace 757-200s," says Aviation Partners Boeing's VP sales Patrick LaMoria. "The performance/payload benefit of Blended Winglet technology allows Aeromexico to operate economically, with full passenger loads, out of high/hot Mexico City airport."

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—Patrick LaMoria, VP sales, Aviation Partners Boeing

For Casablanca, Morocco-based Royal Air Maroc, which recently ordered 29 Blended Winglet shipsets for 737-800s and 737-700s, reduced noise and emissions when operating into Europe helped drive the decision to upgrade. "For Royal Air Moroc, the environmental benefits of our technology were particularly important," says Aviation Partners Boeing's director of sales and marketing Christopher Stafford. "Reduced noise and emissions, made possible with our technology, reduce the carrier's operating fees in Europe. With a more efficient wing, Royal Air Moroc has the potential to lower airframe maximum take-off weight to reduce navigation and landing fees within the European Union."

Icelandair found it had an iron-clad case for investing in Blended Winglet technology when it placed an order for seven 757-200 shipsets with options for an additional 15 shipsets. As Icelandair flies its 757-200s about 4,000 hours annually, with average stage lengths of 1,450nm, the Blended Winglet payback is less than two years thanks to fuel savings — close to 200,000 gallons per aircraft per year — and engine maintenance cost savings of about $4,000 per month.

Leasing companies, traditionally hesitant to invest in out-of-production aircraft, now seem willing to 'bend the rules' when it comes to Blended Winglet-enhanced models such as the 757-200. ILFC recently signed a General Terms Agreement to retrofit with Blended Winglets two 757-200s leased by Antalya, Turkey-based SunExpress. As winglets increase residual value and lease rates for lessors, and represent an immediate cash flow positive proposition for lessees, it's a win-win situation. "Leasing companies have become more aggressive recently in investing in our technology for out-of-production aircraft," says LaMoria. "Operators retrofitting leased 757-200s with Blended Winglets typically save three times the cost of additional monthly

lease rates based on fuel savings alone. Any time you can achieve this sort of cash flow positive scenario it's very hard to say no!"

In two of the world's fastest growing airline markets — China and India — Blended Winglet technology has become a vital part of running a successful and cost-efficient airline. Over 110 Blended Winglet-enhanced Boeing aircraft are currently in operation in Asia-Pacific with orders for an additional 121 shipsets. In India alone, Jet Airways has ordered 10 shipsets, SpiceJet has ordered 10 shipsets, Air Sahara has ordered one shipset and Air-India Express, India's newest low-cost carrier, has ordered 22 Blended Winglet shipsets. "We've been very successful in India and Australia, with virtually 100 per cent market penetration, and we have very strong relationships in place with air carriers throughout China," says Aviation Partners Boeing sales director Craig McCallum.

Air Senegal was the first operator in Western Africa to order Aviation Partners Boeing's Blended Winglet technology. Primary application for Air Senegal's first Blended Winglet-enhanced 737-700 will be on the daily 2,625-mile Dakar to Paris route. At typical utilisation rates, Air Senegal will save up to 120,000 gallons of fuel per Blended Winglet-equipped aircraft. This saving translates into one in every 25 Dakar to Paris flights being free, in terms of fuel costs, with close to 15 'fuel-cost-free' round trips to Paris each year.

Over in the sultanate of Oman, Oman Air recently adopted Blended Winglet technology for dramatic range/payload benefits in addition to expected fuel savings of 100,000 gallons per aircraft per year. "The Blended Winglet business case was particularly compelling for Oman Air," says Stafford. "Our technology allows Oman Air 737-800s to depart Muscat 4,400 pounds heavier thanks to a more efficient wing. This translates to 22 additional revenue passengers being boarded, per flight, during hot summer months."

On the mega-order front Southwest Airlines is looking to upgrade as many as 542 737-700s through 2012, Ryanair has committed to 229 737-800 Blended Winglet shipsets and Continental Airlines plans to performance-upgrade up to 51 of its 757-200s with Blended Winglet technology.

"The significance of these orders is huge," says Aviation Partners Boeing's senior VP Marketing Dick Friel. "It really pushes us over the top as far as critical mass goes. There was a time when airlines were asking the question 'Why do we need Blended Winglet technology?' but this question has now changed to 'Why don't we have Blended Winglets?' Today, carriers not taking advantage of Blended Winglet technology are the exception and their operating costs are higher than they need to be."

The future is 'on the wing'

Today, with critical mass achieved, the standard configuration for most of the world's 737-800s and 700s is as a Blended Winglet-equipped aircraft. As Aviation Partners Boeing launches new programmes, an even greater percentage of the global airline fleet will benefit from significant fuel savings, performance advantages and the environmental attributes of Blended Winglet technology.

Looking 10 to 20 years out, Clark envisions many exciting opportunities for the industry: "New commercial transports will become more fuel efficient and aerodynamically fine-tuned, and we're looking into a new generation of uniquely effective drag-reducing wingtip treatments for these future generation transports. I anticipate the emergence of a successful second-generation of supersonic airline transports within the not too distant future, as well as well as new categories of unmanned air vehicles (UAVs) in military, cargo and perhaps even airline transport configurations. We look forward to significantly enhancing the economics and operating efficiency of all of these new transports with our performance enhancing technology. The beauty of Blended Winglets technology is that it's effective for any make or model of aircraft."