Winging it - Aviation Partners Boeing

Every so often, an innovation comes along that revolutionises an industry. For the aviation industry, Blended Winglets would be a definite contender. Reducing fuel burn, increasing performance capabilities of aircraft, reducing noise and emissions, they are in aviation terms the Holy Grail. Founded in 1991, Aviation Partners Inc (API) provides winglets for Gulfstream IIs and, through a partnership with Boeing, for all Boeing commercial aircraft. *AF&AM* talks with Joe Clark, CEO of the company.

Originally designed for the Gulfstream II, Blended Winglets have become part of the Boeing profile.

"Like any invention that you come up with where there's a little company and a big company, there is always a lot of scepticism."
—Joe Clark, CEO, Aviation Partners Boeing.

Necessity is the mother of invention. When entrepreneur Denis Washington wanted to update his Gulfstream II, improving its performance and modernising its appearance, without investing the millions of dollars necessary for a new model, he turned to his friend, Joe Clark, founder of Horizon Air and Jet Air, (the first Lear Jet distributorship in northwest north America), to come up with a design to meet the challenge. It heralded the start of Aviation Partners Inc (API). Clark gathered together a ''dream team'' of eight retired engineers with an impressive pedigree of experience and expertise. Working under former Boeing chief aerodynamicist, Louis Gratzer, two years of endeavour resulted in the Blended Winglet design which was patented in 1993.

Though the theory was not new - that by relocating the wingtip vortex, drag can be reduced, resulting in greater operational efficiencies - the curved design of the Blended Winglets, and their effectiveness, were. Tests on the Gulfstream II showed an improvement in fuel burn of seven per cent, in addition to improved performance capabilities, reduced emissions and a quieter noise footprint.

The results piqued the interest of Boeing Business Jet (BBJ) president Borge Boeskov, as much for the aesthetics of the Blended Winglet design, which would differentiate the BBJs from the commercial B737-800, as for the operational benefits they would add to the aircraft. A prototype winglet design for the BBJ improved its performance by 6.5 per cent (which API de-performed to five per cent for reasons of wing load factors). Boeing consequently decided to apply the winglets to all BBJs. In 1999, the two companies formed a joint venture to this end. Aviation Partners Boeing (APB) was born.

Under the agreement, Boeing provides the funding, aircraft technical data and API, the technology, Blended Winglet design, marketing, and programme management. Though API is the majority share-holder in the venture, ''we prefer to look on ourselves as partners,'' says Clark, the company's CEO. ''We're basically an amalgam of the innovation of Aviation Partners and the strength of Boeing''.

APB has recently gained certification for retro-fitting Blended Winglets to the B737 Classics fleet.

The joint venture, extremely successful, has been an achievement in itself for API which had to overcome a mountain of market scepticism - particularly from Airbus and Boeing - as to the validity of its performance claims of the winglets. Such market reticence is understandable. The "Dream Team", retired and in their seventies, had succeeded where so many had failed before, not only achieving the most impressive results in the market, but using outmoded methods of engineering and testing. Eschewing the use of computational fluid dynamics and wind tunnel testing - "wind tunnels do not give you accurate information on the performance of winglets," says Clark - the engineers had instead opted for the more old-fashioned method of instrumenting - flying aircraft at different points in the sky and at different settings and weights, and from that designing the prototype winglets.

Boeing has, of course, since revised its opinion, "but in the initial stages it was a rocky road," says Clark. "Like any invention that you come up with where there's a little company and a big company, there is always a lot of scepticism. Boeing is a big ship and big ships take a long time to turn. It is the same with every big company. But I will say, the proof of the pudding is in the eating, and since we added Blended Winglets to the B737, it has just been a snowballing market."

The STC for the BBJ Blended Winglet design was received in 2000. To date, 86 BBJs have been sold, more than double Boeing's estimates of between five and 10 sales annually. This is in no small part due to the Blended Winglet design, says Clark, which has given the aircraft a very distinctive, very sleek and very modern look.

APB received the STC for Blended Winglets for the B737-800 in 2001. Winglets remain an optional extra on production B737NG aircraft, but B737-800s equipped with winglets can fly further, burn up to five per cent less fuel, or carry up to 4,000lb more payload than standard models states Clark, as well as being quieter, providing lower engine maintenance costs and improved take-off performance at high altitude airports in hot climate conditions. One of the first customers for the Blended Winglet-equipped B737-800 was Qantas, which placed an order for seven with an additional 40 options, citing winglets as the deciding factor in the sale. To date, 25 per cent of the B737NG market has been fitted with winglets, a figure which Clark believes should grow to between 75 and 80 per cent in the future.

More recently, APB has received STC certification for a Blended Winglet design with which to retrofit B737 Classics. The company is also in the throes of developing winglets for B757, B767, B747 aircraft. Most of the research and development for these latter has been done, says Clark. "We're at the point now where we are out seeking customers to launch these programmes."

The one blot on the horizon is the downturn and consequent cash-shortages of the airlines. A stagnant market is never going to be condusive to sales and consequently, while there has been a lot of interest in the B737 Classics' retrofit winglets, says Clark, "that hasn't culminated into large orders as yet." No takers, either, to launch the B757, B767, B747 winglets, despite the proven efficiencies and cash-savings that they could bring the airlines. It is a significant challenge. "If we could somehow finance these airlines, then we would have double

the amount of winglets on aircraft than there are now, and airlines would be saving a lot more fuel. If we could finance the winglets on fuel savings alone, we would put them on every single aircraft.''
In fact, Blended Winglets can, and should be, applied to all 25,000 commercial aircraft in the market, believes Clark, translating into savings of billions of barrels of fuel, good not just for airline coffers but the environment. But while APB has actively been trying to find a solution to the financing that currently stymies its market, any talks with banks - one possible solution for gaining funding - have proved fruitless as financial institutions have become increasingly no-risk lenders. A possible other solution, and one which would make good sense, says Clark, would be governmental aid in the form of tax credits. But to date, all requests have fallen on deaf ears.
But when the market does return, Clark anticipates high demand and despite a market under siege, APB has notched up some significant orders under the direction of its new CEO, Mike Marino. In June, Canadian low-fare carrier WestJet announced that it would be installing Blended Winglets on seven of its B737-700 fleet, making it the first North American carrier to operate B737-700 Blended Winglets. Aloha Airlines placed an order in August for its entire fleet of 12 B737-700s which it will operate under lease from GE Aviation Services. Significantly, in June 2003, Southwest Airlines announced its decision to affix Blended Winglets to its entire B737-700 fleet, both present and future. It means substantial business: 169 installations of winglets to be carried out over a period of two years (beginning in October 2003). Southwest also has options to acquire an additional 373 winglets through to 2012.
The order, says Clark, coming from the trendsetting airline, should encourage other airlines to follow suit. ''Certainly, I think it's an endorsement of our technology. I think we will save Southwest close to 17 million gallons of fuel this year alone, based on 170 aircraft fitted with winglets saving roughly 100,000 gallons of fuel per airframe. Southwest is a very sophisticated airline and they carried out a very sophisticated feasibility study before they made the decision to put Blended Winglets on their entire fleet. We worked very closely with them; the design was thought out very carefully over a period of time.'' Bearing in mind the growing number of low-cost carriers in the region, as well as growing environmental regulations, Clark believes that Europe will provide a particularly lucrative market for the winglets - although their cost-savings appeal is universal.
As for the competition, while Airbus produces its own winglets (first displayed on an A320), the market is so far remarkably free from independent winglet manufacturers. Quiet Wing Systems designed winglets for the B727 and there have been murmurings of moving on to providing winglets for B737 Classics and B747s, but Clark does not see Quiet Wing Systems as competition. ''In fact, zero,'' he says. ''Our Blended Winglets are certified on the B737 Classics with Boeing support and a Boeing warranty. The fact that we are a partner with Boeing, and that we have access to all their data plus their full support, that is key for airlines. I think we have the superior technology.''
A design that API is currently working on is the Spiroid winglet. This is, basically, a double winglet design which, through being circular, eliminates the wing tip vortex thus further reducing drag. Results so far have shown a 10 per cent decrease in fuel-burn. However, the product will not enter the market for several years yet, says Clark, and when it does, it will probably be applied to business jets first with a view to extending it to commercial aircraft. ''We're always looking at new technologies, but when you have innovations, it takes a certain amount of time to get the marketplace to accept it and put it into service and see how it works.''
The near future, though, looks positive with healthy opportunities ahead for the company. As airlines increasingly focus on their costs and cost-savings, the move to Blended Winglets will be inevitable, says Clark, not just for Boeing aircraft, though these will represent the higher proportion, especially the B737 by virtue of numbers, but for the whole commercial fleet. ''Without doubt, I think you are going to see winglets on most aircraft in the future,'' he says. ''I don't think there is any question about it. From a cost standpoint alone, the argument for is just too compelling.'' ◆

Staring at the future: a Blended Winglet.

"I think we will save Southwest something like 17 million gallons of fuel this year alone, based on 170 aircraft fitted with winglets saving roughly 100,000 gallons of fuel per airframe."
—Joe Clark, CEO, Aviation Partners Boeing