

As the world's oil prices continue to climb, nowhere is the impact more keenly felt than in aviation. Any increase in the price of oil has an immediate effect on the world's airlines, but the follow-on effects of the continuing increases extend far beyond airline ticket counters and boardrooms; the modern world relies on aviation to a far greater degree than many people realise.



While the 2009 "recession" might have slowed the insidious climb of oil prices temporarily, it was hardly a welcome solution to that particular problem. What it did, though, was to reinforce the need for airlines around the world to reassess their economic models and plans for the future.

One of the outcomes of all this global aviation soul-searching has been a noticeable resurgence of turboprop orders amongst regional airlines. The turboprop is definitely making a strong comeback, with the turboprop manufacturers (ATR, Bombardier & Cessna) continuing to secure significant orders despite the economic downturn.

Between 2002 and 2007, well before the recent economic doom, the sales of western-built turboprops rose more than 700%. Today, they account for around 37% of sales of regional aircraft with less than 110 seats. In 2002, the figure was just 11%.

An important feature of turboprops is the fact that not only do they consume less fuel (typically around one-third less) than equivalent-sized regional jets, but also—importantly—this equates directly to fewer emissions. For example, both ATR and Bombardier claim their aircraft (ATR72-500 and Q400

respectively) produce up to 50% less CO₂ emissions than similarly sized modern regional jets and as much as three times less than older generation **jets. This is becoming an increasing factor in airlines' thinking with the ever-growing public awareness of environmental issues.**

On short routes, jets will never be as economical or efficient as turboprops. Turboprops are more efficient at low altitudes and lower speeds, whereas true jets only become fully efficient at high altitude and high speed. The fact that turboprops cruise at much lower altitudes than jets adds to their efficiency on short routes, as they spend a smaller percentage of their time at high power climbing to altitude and more time at economical cruise settings.

All things being equal, it is only on longer routes of around 200 nm or more that the speed advantage of the jets begins to make their additional fuel-burn—and cost—worthwhile. In the case of the Bombardier Q400, which has a cruise speed of **360 knots, jets' speed advantage isn't even**



really felt on sector lengths below about 300 nautical miles.

These days, things like delays on the ground, inconvenient routing to fit with airway requirements and traffic congestion are far greater factors than the straight speed difference between turboprops and jets and frequently negate any minimal difference in block times between the two types.

Turboprops have around 20% greater propulsive efficiency than jets; the propeller is an extremely efficient provider of thrust at low speed and low

level. This means that turboprops can operate from shorter runways. Thus they offer more flexibility to airlines in deciding route structures.

When fuel was a “reasonable price” (and there was less emphasis on environmental responsibility), fuel represented a relatively small percentage of overall direct operating costs. Those airlines that were prepared (and able) to pay the extra money to feed thirstier jets often did so in efforts to attract more of the passengers for whom “only a jet” would do. However, as fuel continues to get more expensive, it is assuming ever more importance in airlines’ thinking. From now on, the combination of financial imperatives and the growing public environmental awareness will see more and more turboprops taking their rightful places as the short-haul regional aircraft of choice.

Horizon Air in the US is an example of an airline that is replacing its regional jets with turboprops. A sister airline to Alaska Airlines, Horizon began as a turboprop operator in the early 1980s using Fokker F-27 Friendships but began incorporating regional jets in its fleet in the early 2000s. While it still has 18 Bombardier CRJ700 regional jets operating alongside its fleet of 37 Bombardier Q400 turboprops, Horizon announced in 2008 that it intended to replace its CRJ700s with more Q400s and become an all-turboprop fleet.

In the late nineties—before 9/11 shook the world and before the whole fuel situation started to become truly grim—a number of erstwhile turboprop makers ceased production and closed the doors on their turboprop lines. The appearance of new regional jets like the Bombardier CRJ and the Embraer ERJ145 were the death knell for the British Aerospace ATP (an evolution of the Hawker Siddeley HS 748), the British Aerospace Jetstream 41 (an evolution of the Jetstream 31), the Saab 340 and the Saab 2000. It seemed as if jets—especially the new crop of (then affordable) regional jets—was the way of the future. Had those turboprop manufacturers just waited another few years, they would undoubtedly have their order books full, just as the last remaining western manufacturers—ATR and Bombardier—do now.

In 2006, ATR announced firm orders for 90 new aircraft and 26 options. It received 113 orders for new ATRs in 2007—a record since the programme began. **The company's turnover was US\$1.1 billion in 2007—56% higher than in 2006.** In 2008, despite having endured several months of the same **“economic downturn” affecting the rest of the world, its turnover had risen still further to US\$1.3 billion.** Another year later—and despite a full year of weathering the global financial storm—**ATR's turnover rose again to \$1.4 billion in 2009.**

ATR still managed to secure 40 orders in 2009 (only two fewer than in 2008) and it delivered 54 aircraft (compared to 55 in 2008). The company still has an order backlog for 136 aircraft. Meanwhile, as at the end of January 2010, **Bombardier's backlog stood at 75 Q400s.**

Advances in technology are gradually addressing the dislikes expressed by passengers about turboprops, one of which is their interior noise.

Incorporation of new materials in fuselage and cabin construction, and the introduction of various

active noise reduction

systems are making new turboprops significantly quieter than older aircraft.



Unfortunately, amongst much of the non-aviating travelling public, there is an all-too-common misconception that an aircraft is “old fashioned” just because it has propellers. This is certainly not the case. Turboprop engines like Pratt and Whitney PW127 and PW150 (both evolutionary variants of the PW100 series) that power the ATR and the Bombardier Q400, respectively, are extremely modern efficient jet engines; they just happen to have gearboxes and propellers strapped to their noses to transform them into turboprops.

Modern turbine engines like the PW127 and PW150 seldom need any major maintenance. With their vibration-free turbine engine cores, they simply remain on the wing, requiring little more than oil and filter changes and scheduled inspections to ensure ongoing health. To be fair, while they are vastly more reliable than piston engines, turboprops still require more maintenance than their straight jet counterparts because of their associated gearboxes and propeller components. Indeed, before fuel prices began their ludicrous ascent, the additional maintenance involved in operating turboprops was a major factor contributing to the increase in jet numbers in the regional market.

Just as the turboprop consigned its reciprocating ancestors to history, for a time, many people believed that the turbofan would supplant the turboprop in the same way; British Aerospace and Saab obviously believed it and stopped building turboprops. There is no doubt that the straight (turbofan) jet engine has a number of advantages over the turboprop. It is even more reliable, proportionally lighter and even easier to operate than its propellered relative. For long-range, high-altitude fast travel, nothing can touch the modern turbofan.

However, the finite limits of the world's oil reserves and the realisation that "environmental impact" is not just an expression of emotional "tree-huggery" has led to a complete re-think. The turboprop is back—for good.

With thanks to the author, Rob Neil – Editor – Pacific Wings

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