

## Big Times Ahead For Small Propulsion Engine Maintenance

The SPE market includes some of aviation's fastest expanding customer groups

**One segment of aviation services is dynamic, growing, but overlooked: the commercial small propulsion engine (SPE) maintenance market.**

Given its vigor and the change that is inevitable, SPE maintenance is a sure source of business opportunity.

It includes some of aviation's fastest expanding customer groups, such as regional airlines and fractional operators, spans three engine categories – turbofans (<20,000 lb thrust), turboprops, and turboshafts – and embraces four major end-user

groups, including air transport, business/general aviation, government/military, and rotary wing operators. As it expands, develops, and becomes increasingly global, SPE maintenance will require rising levels of technical sophistication from operators and maintenance suppliers alike.

Based on unique insights gathered from in-depth analysis and interviews with almost 100 SPE operators and suppliers, this Commentary profiles the characteristics of the market and highlights the challenges and opportunities facing SPE maintenance suppliers, original equipment manufacturers (OEMs), and operators.

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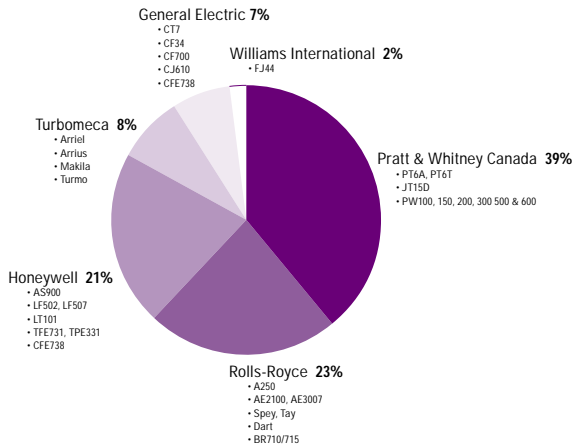
**Snapshot: The Small Propulsion Engine Fleet**  
 The 2003 commercial SPE fleet exceeds 90,000 engines – nearly three times the size of the equivalent commercial “large” engine fleet. Pratt & Whitney Canada is the biggest manufacturer (39%) followed by Rolls-Royce (23%) and Honeywell (21%). Other OEMs are Turbomeca (8%), General Electric (7%), and Williams International (2%). Two-thirds of the fleet is domiciled in North America and South/Central America.

The SPE fleet is remarkably fragmented. With more than 18,000 operators across the globe, the average fleet is just five engines. Government and military operators have the largest average fleet size (17.2 engines per operator), while corporate and general aviation operators have the smallest (3.5 engines per operator).  
 Over the next ten years, AeroStrategy forecasts that more than 40,000 SPEs will be delivered (excluding spare engines). Taking into account an estimated 16,000 retirements, the SPE fleet will grow to just over

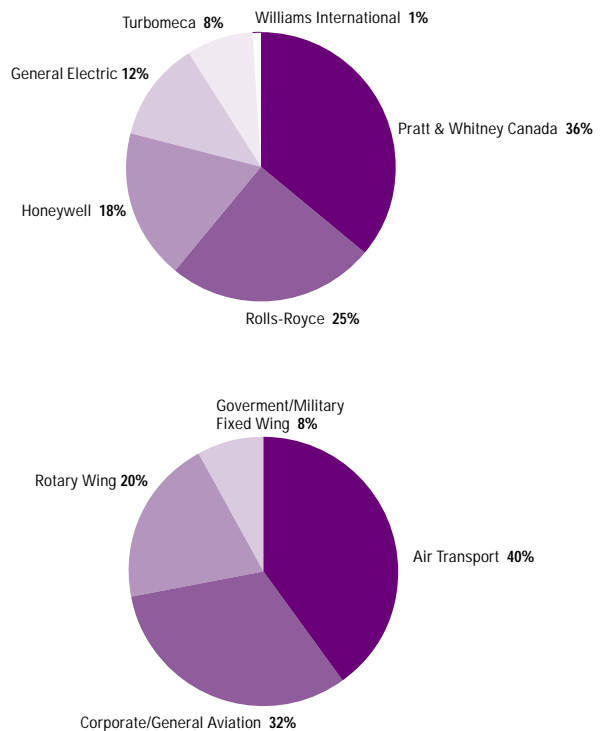
114,000 engines by 2013 – an annual growth rate of 2.3%.

**Snapshot: The SPE Maintenance Market**  
 AeroStrategy analysis shows that the SPE maintenance market is approximately \$3.8 billion (Figure 2). Pratt & Whitney Canada engines account for 36% of demand, Rolls-Royce 25%, Honeywell 18%, GE 12%, Turbomeca 8%, and Williams International 1%. Air transport is the largest end-user segment at 40%. Corporate and general aviation is next (32%).

**Fig 1. 2003 Commercial SPE Fleet  
 Total = 90,256**



**Fig 2. 2003 SPE Maintenance Market  
 Total = \$3.8 Billion**

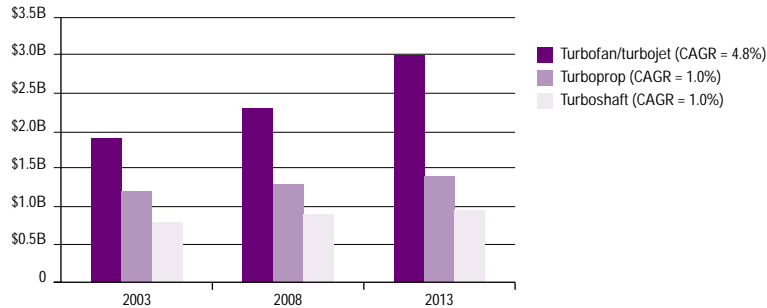


SPE maintenance demand is highly fragmented across several engine models. The largest individual markets are PW100 (8%), A250 (7%), PT6A Small (7%), and CF34-3 (7%). The remaining 71% comprises over 20 other engine families. More than 20,000 major maintenance events (overhauls and hot section inspections) are projected for 2003.

Looking farther into the future, AeroStrategy forecasts that the SPE maintenance market will reach \$5.1 billion by 2013, a 3.0% annual growth rate. Williams International engines will generate the greatest growth (12%), a result of the popularity of ultra-light business jets powered by Williams-Rolls FJ44 engines. GE engines, buoyed by the CF34 market, will also experience robust growth of 7% annually. In contrast, demand for Honeywell engines will be relatively flat due to TPE331 and TFE731 retirements, replacement of LF502 and LF507-powered regional aircraft by other regional jets, and limited penetration of its new engine models in the forecast window.

The SPE market will also undergo a notable structural shift from turboprop and turboshaft powered aircraft to aircraft driven by turbofans (Figure 3). Turbofan and turbojet engines currently account for about half of the SPE maintenance market (\$1.9 billion)

**Fig 3. SPE Maintenance Market Forecast (\$B)**



followed by turboprop (\$1.2 billion) and turboshaft engines (\$0.7 billion). But, with deliveries of regional and light business jets expected to remain brisk, AeroStrategy predicts turbofan maintenance demand will rise at a cumulative annual growth rate (CAGR) of 4.8% – far in excess of the 1% expected in the turboprop and turboshaft segments.

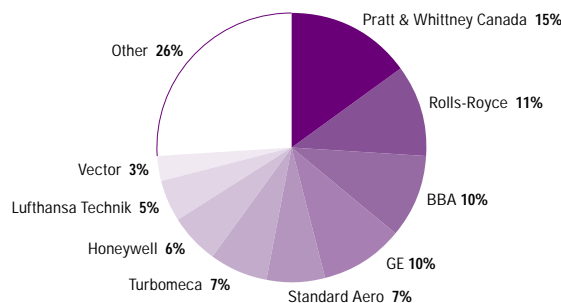
OEMs and independents are the two primary supplier groups competing for this business. In recent years OEMs have leveraged their considerable strengths, including control over spare parts and intellectual property, to

expand their share of the maintenance market. They have supplemented these advantages with an aggressive investment campaign to add new regional service facilities. Independent suppliers have been squeezed but have still managed to maintain a sizeable share of the market by offering competitive prices, being responsive, and bundling engine maintenance with other services, such as airframe maintenance and modifications.

Not surprisingly, the Big Five small propulsion OEMs are all major players, accounting for five of the top seven suppliers (Figure 4). Pratt & Whitney

The SPE maintenance market will reach \$5.1 billion by 2013

**Fig 4. 2003 Commercial SPE Maintenance Market \$3.8 Billion**



**BBA and Standard Aero  
are the largest  
independent suppliers**

Canada is the single largest maintenance supplier with a 15% share of the SPE market, with Rolls-Royce (11%), GE (10%), Turbomeca (7%), and Honeywell (6%) close behind. Pratt & Whitney Canada

growth and as it revises its authorized maintenance center (AMC) agreement on the A250. GE gets much of its double-digit share of the global SPE maintenance market from ownership of Garrett Aviation Services, a major

Independent suppliers also play an important role in the commercial SPE maintenance market. Within this group, BBA (10%) and Standard Aero (7%), both beneficiaries of savvy acquisition campaigns, are clearly the largest. In recent years, BBA scooped up Dallas Airmotive, H+S Aviation, and Premier Turbines. Not to be outdone, Canadian supplier Standard Aero purchased overhaul facilities in the Netherlands and the United States. As a result, BBA and Standard Aero now have the critical mass and global reach to invest in new engine models and compete effectively with the OEMs.



Other significant independent supplier groups include Lufthansa Technik (5%), which owns Bizjet International and Lufthansa AERO, and Vector Aerospace (3%), which owns ACRO, Atlantic Turbines, and Sigma Aerospace. Dozens of independents compete for the remaining quarter of the market.

One unusual feature of the SPE maintenance market is that, unlike the large propulsion engine maintenance market, a surprisingly low percentage of operators have captive maintenance facilities. AeroStrategy believes that captive shops have less than a 5% share, the result of small average fleet size and a strong focus by SPE operators on core transport activities.

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benefits from a large installed base, investment in a global service center network, and innovative commercial offerings such as the Eagle Service Plan. Rolls-Royce will likely increase its share of the market as AE3007 demand accelerates from regional jet

Honeywell engine overhaul supplier. Though each OEM pursues a unique aftermarket strategy, the trend is toward greater OEM control. Williams International and Turbomeca lead the way with the highest maintenance market shares for their own engines.

### What SPE Customers Want

One challenge confronting SPE maintenance suppliers is the diverse universe of operators, covering most of the commercial aviation market:

#### Air Transport

Passenger and cargo carriers, operating turboprop and turbofan powered fixed-wing aircraft.

#### Corporate/General Aviation

Fixed wing aircraft used by corporate flight departments and general aviation operators, including fast-growing fractional operators.

#### Rotary Wing

Helicopter operators supporting a broad range of missions (resource development, charter, emergency medical services, corporate aviation, tourism, parapublic, military, and utility services).

#### Government/Military

Fixed wing aircraft operated by government agencies and military organizations.

Not surprisingly, SPE customer needs vary considerably across and within these operator groups. Air transport operators – regional jet operators especially – are most concerned about the high cost of engine maintenance. These airlines are witnessing large increases in engine shop visit costs for new turbofans (e.g., CF34 and AE3007) relative to the turboprop engines that were once the majority of their fleets. Fortunately, a large percentage has contracted for cost per hour programs with OEMs.

In contrast, turboprop operators, with older and more predictable engine fleets, are generally more price sensitive and closely monitor shop visit cost.

Corporate and general aviation have different needs again. Corporate flight departments are typically risk-averse and therefore interested in technical quality and commercial guarantees (e.g., cost per hour programs), while

The needs of fractional operators are more like airlines than traditional flight departments



financially strapped general aviation operators tend to focus on shop visit cost. With more than 600 aircraft in operation today, fractional operators have recently emerged as an important part of the corporate and general aviation segment. Large fleets, broad geographic coverage service areas, and an emphasis on dispatch reliability make their needs more like airlines than flight departments.

Rotary wing operators have the most varied maintenance requirements, partly as a result of the diversity of missions performed by helicopter operators, from offshore resource exploration (supported by large fleets) to tourism, emergency medical services, and corporate and utility missions

Government and military operators place a premium on technical quality and OEM authorization



The small and large engine maintenance markets appear to be converging

(using smaller fleets). Rotary wing operators generally value technical quality, commercial guarantees, local presence, and OEM authorization.

Finally, government and military operators place a premium on technical quality and OEM authorization. Local presence and "in country" capability also matter to some, though definitions of local presence vary.

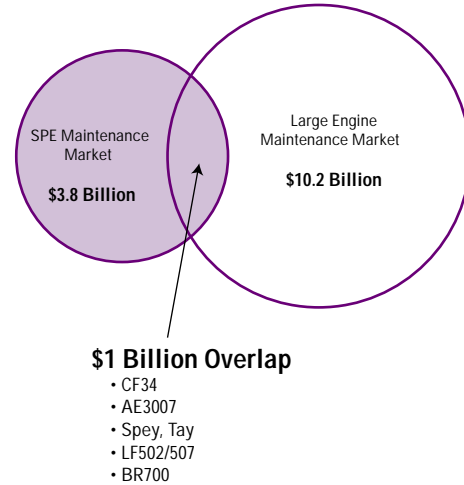
**Marching Toward Market Convergence**

The SPE maintenance market has traditionally been considered a world apart from the more glamorous large propulsion engine maintenance market. This is not surprising. There was once a significant gap between the thrust range of the SPE market (2,000 - 6,000 lbs) and that of the large engine market (>14,000 lbs), typified by the venerable JT8D. The growing popularity of regional jets and larger business jets, powered by engines with between 6,000 and 18,000 lbs of thrust, has largely erased this distinction.

Market convergence could drive OEM consolidation

These days the high end of the \$3.8 billion SPE maintenance market overlaps considerably with the low end of the \$10.2 billion large engine maintenance market (Figure 5). Maintenance spending for engines in this "zone of overlap" is worth approximately \$1 billion in 2003, and

**Fig 5. 2003 Small and Large Commercial Engine Maintenance Markets ~\$13 Billion**



suppliers from both markets compete for this business. Consider maintenance for the CF34. Of the six non-OEM suppliers, half come from the large engine market (Delta Tech Ops, Air Canada Technical Services, Ishikawajima-Harima Heavy Industries) and half from the SPE market (Lufthansa AERO, MTU Berlin-Brandenburg, and Standard Aero). This is a token of a larger trend: the small and large engine maintenance markets appear to be converging. This convergence has two potentially significant implications:

**Entrants Emerge**

Air transport operators, who have seen large engine overhaul supplier choice dwindle in recent years, may see new maintenance suppliers emerge from the SPE ranks. Why couldn't highly regarded SPE

independents like Standard Aero or Dallas Airmotive enter the CFM56 or V2500 markets?

**OEMs Submerge**

Market convergence could drive engine OEM consolidation. It is worth noting that the four major large engine OEMs (GE, Pratt & Whitney, Rolls-Royce, and Snecma) overlap considerably with the five major small propulsion engine OEMs (GE, Pratt & Whitney Canada, Rolls-Royce, Snecma/Turbomeca, and Honeywell). The outlier is Honeywell, which also faces a relatively flat engine maintenance demand outlook and falling business jet production rates. Should engine OEM consolidation continue, Honeywell's engine business appears the most likely to combine with another engine manufacturer.

# Conclusions

The SPE maintenance market is undergoing change:

- It is shifting from a market dependent on turboshaft and turboprop engines to turbofans.
- Its supply base is changing from a large number of small suppliers to a relatively small number of sophisticated OEMs and independent networks. It will therefore be increasingly controlled – directly or indirectly – by engine OEMs.
- It shows signs of convergence with the large engine maintenance market.
- It will witness for the first time a very large number of engine retirements – in excess of 16,000 by AeroStrategy estimates.

What are the implications for operators, OEMs, independent suppliers, and the broader aviation community?

*1. Most operators will likely have to choose from fewer but better resourced suppliers in the future as OEMs increase aftermarket control and supplier consolidation continues.*

This will create opportunities through supply base stability, new types of services provision, and increased

component repair development.

At the same time, there will likely be reduced levels of competition for many engines as major suppliers seek to align themselves more closely with OEMs.

*2. OEMs will need to navigate carefully between the twin imperatives of customer satisfaction and aftermarket profitability.*

Can Turbomeca, for example, continue to disallow overhaul competition for an important and popular engine like the Arrius and at the same time improve customer satisfaction? At the other pole, can Honeywell achieve profitability targets while holding a relatively low share of maintenance market for its own engines?

Pratt & Whitney Canada's objective of a 50% maintenance market share for its own engines appears to strike an appropriate balance.

*3. Independent maintenance suppliers face continued consolidation.*

The two largest independent maintenance suppliers, BBA and Standard Aero, appear poised to benefit from projected SPE market growth. Lufthansa Technik also seems secure. Its SPE maintenance business is part of a \$5 billion aviation maintenance portfolio. The fate of the remaining 30-plus independents is

less clear, as these suppliers share roughly one-quarter of the market and many appear to be below critical mass. What's more, many depend heavily on the slower growing turboprop and turboshaft maintenance markets. Given the scale-intensive nature of engine overhaul, there appears to be strong grounds for further supplier consolidation. But some customer groups, particularly rotary wing and government/military, place a high value on local presence. Furthermore, the large number of engine retirements could create opportunities for new suppliers or non-OEM authorized facilities. The likely result will be continued – but incomplete – consolidation of smaller independents.

*4. The convergence of the SPE and large engine maintenance markets will have ramifications for the broader aviation community.*

This phenomenon will create new customer choices, influence supplier strategies, and catalyze further engine OEM consolidation.

The SPE maintenance market is a dynamic and growing segment of aviation that has been largely overlooked for far too long. Properly regarded, its evolution will significantly affect the aviation industry for years to come.

**OEMs will need to navigate carefully between the twin imperatives of customer satisfaction and profitability**

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*AeroStrategy has available for sale a comprehensive report on the SPE maintenance market, providing more detail and insight into each engine model, customer needs and the supply base. Any readers interested in purchasing should contact AeroStrategy as indicated.*

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Printed July 2003