

APU market becomes increasingly compact

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When General Electric's (GE) Jack Welch got wind of talks between United Technologies Corp (UTC) and Honeywell he could but act. At a special meeting in New Jersey in January, Honeywell shareholders overwhelmingly voted in favour of a merger with GE. Regulatory approval in both the US and Europe is likely to follow.

Should any UTC deal with Honeywell have gone through without divestitures, all auxiliary power unit (APU) manufacture could have come under one banner.

GE's intervention has kept separate the two APU camps, but its acquisition-cum-merger of Honeywell has prompted fresh fears among airline and independent shops. Not only is GE a major main engine original equipment manufacturer (OEM), but it has acquired a massive engine maintenance, repair and overhaul capability.

Adam Clark, manager propulsion and APUs at Air Canada, said: "We are fearful that that kind of situation is going to be repeated in the APU world as well." OEM dominance of the aftermarket will be a key issue over the next few months, especially given GE's financial clout.

The OEM low-down

Honeywell does not need to come under the GE banner to enjoy a high profile in the APU market; that comes from a long history of development with airframe OEMs. In autumn 1999, the merger of Honeywell and AlliedSignal produced the Honeywell that GE is in the process of acquiring. AlliedSignal brought to Honeywell a catalogue of APUs developed during its previous incarnations. AlliedSignal was the result of a merger between Allied and Signal in 1985. Signal had previously merged with the Garrett Corporation, becoming Signal in 1968.

"We have a strong presence in the APU business," said David Elston, Honeywell's director of marketing for APUs. "Our APUs range from about 100 shipsets to about 1,400. We have APUs on executive aircraft and regional, as well as military, and then, of course, commercial narrow- and widebody also." In fact, Honeywell provides APUs for more than 150 different types of aircraft worldwide.

The emphasis for future development is firmly on improved reliability, both in flight and on the ground. Honeywell claims mean time between unscheduled removals (MTBUR) figures of well over 8,000 hours "about four years" operation "for some models.

Hamilton Sundstrand's power systems division was originally the radial engine division of Solar Turbines, incorporated in the early 1960s. Ownership has changed from International Harvester to Caterpillar to Sundstrand and now to Hamilton Sundstrand, but its focus has remained the small APU market.

For aircraft with passenger capacity of more than 100, Hamilton Sundstrand has sold its products under the Auxiliary Power International Corporation (APIC) brand name. Established in 1989, APIC consisted of Sundstrand's power systems division and Labinal's Turbomeca division, which the former acquired in 1996. Sundstrand was bought by UTC and merged with UTC's former Hamilton Standard division. Hamilton Sundstrand now owns APIC.

The OEM claims that the APS 3200 for the Airbus single-aisle family of aircraft is the lowest weight APU option for the A320 family and is certified for Etops of 120 minutes; the APS 2000 for the 737 is also Etops certified. The APS 2100 is for the 717, while the APS 1000, APS 500R and the APS 500 are all for regional and smaller aircraft applications.

Hamilton Sundstrand says 737/717 APU reliability has increased almost 50%, as has the APS 3200. "Maintenance practices, computer-based trouble-shooting tools and improvements in overall hardware durability have each contributed toward these dramatic on-wing performance improvements," stated the OEM. "As a direct result of the improvement in MTBURs, on-wing time has been extended, yielding decreasing costs per hour. APU health monitoring can improve these numbers even further."

Pratt & Whitney Canada, Hamilton Sundstrand's sister company, is an emerging player in the APU OEM market. With only two APU products to its name, it has nevertheless made waves in the APU market, given the selection of the PW9XX by Airbus for the A380. The PW9XX is a

derivative of the PW901A for the 747-400, whose performance has delighted its manufacturers. "It's a really good story for the 901A," said Denis Marchand, senior marketing account manager at Pratt & Whitney Canada. "Our current MTBUR rate is 28,000 hours. This is a rolling average. The total shop visit is one event per 12,000 hours and we have APUs that last 17,500 hours on-wing without a shop visit. The APU is a very durable product and reliable as well."

Airline reaction

While the OEMs claim improved reliability on their new products, not all operators are impressed. Clark at Air Canada said: "The problem with the APU is that it's an engine that's set up to run without being monitored and, as a result, it's got all kinds of gadgets and whistles and bells that will shut it down if it senses something's wrong. The problem is that all these protective devices end up making the thing unreliable. So what we'd like to see is improved reliability of accessories."

Robert Matson, manager propulsion engineering at USAirways said: "You couldn't live with the type of reliability on a main engine that you see on APUs." He wants to see OEMs putting more design hours into APU diagnostic development and for condition monitoring to be more a foreteller of delays and cancellations than simply to predict potential performance problems. After all, unreliability means delays and delays are expensive.

At Hamilton Sundstrand emphasis is being placed on diagnostic technology. The company has a web-based health monitoring system that allows airline customers to track those APUs that are showing signs of degradation of key monitoring parameters.

Peter Gille, APU workshop manager at Sabena Technics, has witnessed a significant improvement in reliability in the short- and medium-haul APUs; there is still some way to go on the bigger APUs. The APU shop at Sabena Technics focuses on the 331-350 for the A330 and A340, but expects to ramp up capability to cover the APS 3200 in the spring. Gille would like to see improvements in the 331-350 load compressor module.

As with main engines, avionics and most other components, reliability comes at a price. Clark at Air Canada pointed out that, given that initial APU purchase costs are rolled into the aircraft acquisition costs, the cost of ownership does not become apparent until spares are required.

Not only is APU operational reliability an issue, but so too is reliability of new parts and new materials. Laura Logan, business manager for APUs at Air Canada, expressed the frustration associated with new parts being recalled by the OEM. This raises the question of manufacturer approval (PMA) parts availability. "PMA parts availability in APUs is very limited at this time. They're more heavily into it on the main engines," said Clark.

"But there's a lot of interest," added Logan. "Between now and another five years, I think there will be a big expansion in the PMA market," claimed Gille, adding that there are very few PMA parts available for new-generation APUs.

According to Matson, acceptance of PMA parts in the APU market will depend on three factors: "the criticality of the part; the reputation of the individual company that is producing the part; and the need and demand for that particular part". He added: "The safety of a PMA part isn't necessarily gauged by the amount of regulation that is thrown at it."

Gary Smith, general manager at Triumph Air Repair (Europe) Ltd (Tarel), said Tarel "the largest independent APU repairer" is very open to PMA parts use. "We very much encourage our customers to consider them when they're available" and that's growing "and we're working actively with developers to get more availability. But, as always, it is 100% up to the customer. There's a way to go as yet." In the past two years, airlines, especially in Europe, have surrendered their resistance and are actively seeking an alternative to OEM parts.

The shape of MRO

"Consolidation" is the key word, reiterated time and again, in the aftermarket. "I think that a lot of the smaller players are going to drop out, especially in the future as the technology and service level demands involved in getting into a product increases," said Smith at Tarel. "The smaller guys are going to disappear." Not only are OEMs and repairers prey to the big players, but so too are repair vendors that feed the network.

OEMs, generally speaking, have the upper hand on MRO. "Warranty coverage aspects force or entice a lot of the operators to stay with the OEMs for their repairs," said Logan.

Pratt & Whitney Canada appears an exception to this trend. It has only 10% of the aftermarket on the PW901A; 60% goes to independent shops and 30% stays with the airlines. But with the addition of the PW9XX, Pratt & Whitney Canada is planning to increase this market share. Tarel puts total APU MRO market share generally at 60% to the OEMs and 20% each to the independents and the airlines, although other

commentators put airline activity slightly higher at the expense of the OEMs.

Full service agreements from OEM and non-OEM sources are gaining ground. Full-service agreements are becoming increasingly popular as many airlines develop or turn themselves into virtual airlines, stated Hamilton Sundstrand, whose full support packages cover all repairs, as well as spares provisioning and APU leasing. Hamilton Sundstrand services more than half its worldwide large commercial transport customer base through company-owned or contracted facilities.

Elston at Honeywell said: We can tailor a package to just about anything that a customer wants. Right now, we do APU repair and overhaul in a number of locations worldwide. We have provisions to guarantee turnaround time for our repair and overhaul customers and we have a bank of APUs that we can supplement our service with if an airline wants to borrow or lease an APU from us while theirs is in for service. Costs generally are based on the number of hours the aircraft flies or the number of hours that the APU accumulates. That allows our customers to have a known expense every month or quarter, added Elston. Our maintenance service agreements are increasingly viable for the airlines.

Full APU support from independent shops is another MRO trend. We're being asked to provide a fuller service, said Smith at Tarel. I call it tail to tail. In other words, where the repair shop manages the APU from the point of removal to the point of refitment, and maybe even have some involvement in that as well. It's taking the problem away from the airline. Smith added that some of the big nose-to-tail providers (which offer complete aircraft overhaul) may struggle to incorporate APU overhaul into their services because it is a specialized product.

To deliver a service you need to be dedicated in all areas. I think they'll struggle to be dedicated in so many areas and still offer the very best services for APUs and other large components. This is where the specialist APU repairers will come in.

At the end of 1999, Triumph Air Repair signed a Memorandum of Understanding with Sabena Technics to create a partnership that offers a wide range of APU MRO capabilities through a single contact. More recently, in addition to other product lines, Triumph Air Repair was named the exclusive factory service centre for the Honeywell 660 for the 747 and the 700 for the MD-11, DC-10 and A300B aircraft.

Not only are OEMs packaging their own flight-hour products but, according to Smith, such deals from the repairers are becoming more comprehensive. Flight-hour rates do not just cover APU maintenance costs, but also perhaps APU removal costs, on-wing assistance costs and aircraft downtime costs.

There is a whole catalogue of factors that affect flight-hour rates. According to Smith, the type of APU is just the start. There is the ratio of APU hours to flying hours, the operating pattern of the APU and the region of operation. In addition, there are spare APU sale/leaseback arrangements, logistics management options, the history of the APU in terms of previous shop visits, whether or not the customer accepts PMA parts, modification status and a whole raft of other factors. Then, pointed out Gille, there are flight hour-rate arrangements that cover just the core of the APU. Arrangements are very much customer specific.

Perhaps one of the most significant movements in the aftermarket is specialist repair development. Gille puts APU repair costs at 20% manhours and 80% materials, so there is a huge incentive to salvage materials and develop processes that meet SFAR 36 and DER standards.

The aftermarket is also witnessing increased competition between airline shops for third-party APU repair work. This may be driven not only by the recognition that capital investment costs for APU repair equipment can be optimized by increased throughput, but also by the desire to surrender capability in certain ageing engines and replace it with APU third-party work. This picture is still unfolding.

Future trends

Although OEM and aftermarket acquisition activity is stealing the limelight, there is development work to make APUs cheaper, lighter and kinder to the environment.

The future of APU technology promises simplified units operating without gear boxes, oil systems and, in some cases, even generators, said Hamilton Sundstrand. Rotor speed generators and air bearings make possible the complete elimination of the need for gear boxes and complex lubrication systems. Possibilities exist for integration of APUs and cabin air conditioning, as well as aircraft electrical systems.

At Honeywell, there has been a number of APU programmes over the past few years. On the new APUs developed for the 777 and later for the 737NG and for some regional applications, one new development is the elimination of the cooling fan. We've gone to eductor cooling, said Elston. It greatly simplifies the engine.

Another development that is much discussed, but perhaps some years off, is the fuel cell. The difficulty of the fuel cell is that it's very expensive, fairly heavy and occupies a lot of space, said Riti Singh, head of the department of propulsion, power and automotive engineering at Cranfield University. However, billions of pounds have been spent in other industries to develop lighter, cheaper fuel cells and fuel cells

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could now be considered as APUs for aircraft. Of course, not only could fuel cells potentially make economic sense to operators, but also they could help alleviate the industry's very serious concerns about the environment.

But, however cost-effective APU technology turns out, one trend is set to continue: corporate size counts in the APU manufacturing and MRO market, now and in the foreseeable future. |

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