

# PRODUCT SUPPORT SURVEY 2015

**SPECIAL REPORT**

Data compiled by David Leach

Text by Matt Thurber

## Part 3: ENGINES

**T**he engines are just one of many systems on a business aircraft that can turn a multimillion-dollar transportation tool into a hangar ornament if they misbehave. And more than most of those other systems, their continued good behavior is crucial if the airplane is to serve its occupants safely and reliably. In this, the third and final element of AIN's 2015 Product Support Survey, our readers hand down their verdicts on how well the engine manufacturers take care of them. Those companies, in turn, also get their chance to crow about the top-notch job they think they are doing.

But only one jet maker and one turboprop maker get to enjoy (briefly, before redoubling their efforts to retain the lead) the vindication of knowing that they actually are providing the best support in business aviation.

### JETS

Last year Rolls-Royce and Williams shared top honors among engine manufacturers in AIN's annual product-support survey, each earning an overall average score of 8.0. This year, both companies improved on last year's score but Williams (with an overall average score of 8.3) out-climbed Rolls-Royce (8.1) and stands alone at the summit.

Tied for third place with overall average scores of 8.0 are GE (up from 7.6 last year) and Honeywell (7.9 last year).

Pratt & Whitney Canada, which tied for third place last year with both GE and CFE with 7.6, bumped its score this year to 7.9 and takes fifth place. CFE takes sixth place this year with an overall average of 7.7.

The Rolls-Royce AE3007 and Williams FJ44 share the top spot this year for specific turbofans with the highest overall average score (8.3), dethroning the Honeywell HTF7000, which topped the list last year with 8.1 and shares third place this year with the R-R Tay at 8.2. The Tay is tops for overall reliability, with 9.7.

Tying for fifth place this year with an overall average of 8.0 are four

## What have you done for me lately?

### Williams

In our survey of readers, Williams International finds itself king of the hill—a good place to be, where results are more eloquent than talk of good intentions. Steve Shettler, vice president of product support for Williams, did not know the results of this year's survey when asked, "What have you done for me lately?" His response was quiet and to the point.

"When FJ44 owners hear about the benefits of our Total Assurance Program [TAP], nearly all enroll in it, and most upgrade to our newest program, TAP Blue. TAP Blue is the most comprehensive engine maintenance program in the industry, and the high level of participation shows the program is meeting the needs of our customers. It simplifies ownership



*Williams, which shares the top spot among turbofans, knows what customers want is simple: to get back in the air quickly.*

and enables owners to operate our engines confidently and with no surprises." Among other things, TAP Blue covers all Service Bulletins (mandatory, recommended and optional); foreign object debris

engines: the GE CF34, Honeywell TFE731, P&WC PW500 series and R-R BR700 series.

### TURBOPROPS/TURBOSHAFTS

The rankings of companies supporting their turboprops and turboshafts are the same this year as they were last year, but last year's third-place finisher (Rolls-Royce and its turboshafts, with 6.9) failed to garner enough operator responses this year to be included in the survey.

Honeywell's support for the TPE331 turboprop remains king of the hill, scoring 8.5 this year (the highest overall average in both jets and turboprops), up from last year's top ranking of 8.1 (which was also last year's highest overall average). This engine also rules most of the other categories readers evaluated.

Pratt & Whitney Canada retains second place, with an overall average score of 7.8 this year versus 7.6 last year.

Turbomeca takes third place, with 6.8 this year versus 6.4 last year.

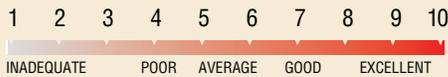
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### 2015 Engine Manufacturer Ratings

	Overall Average 2015	Overall Average 2014	Ratings Change 2014 to 2015
<b>Turbofan</b>			
Williams	<b>8.3</b>	<b>8.0</b>	0.3
Rolls-Royce	8.1	<b>8.0</b>	0.1
GE	8.0	7.6	0.4
Honeywell	8.0	7.9	0.1
P&WC	7.9	7.6	0.3
CFE	7.7	7.6	0.1
<b>Turboprop/Turboshaft</b>			
Honeywell	<b>8.5</b>	<b>8.1</b>	0.4
P&WC	7.8	7.6	0.2
Turbomeca	6.8	6.4	0.4

*\*Companies are listed in order of their 2015 overall average. Ties are listed alphabetically. Bold indicates highest number in each category.*



(FOD) damage; corrosion; forgiveness of minimum annual utilization; major and minor scheduled inspections; and unscheduled repairs.

“Quick response that minimizes downtime continues to be one of our highest priorities, so we have developed real-time analytics accessible to our support team. Our entire team is aware of critical activities at all times, enabling them to minimize downtime by completing maintenance quickly in our repair station, getting parts shipped to service centers or simply responding to a question.”

### Rolls-Royce

Andy Robinson, senior v-p of services and customer support for civil small and medium engines at Rolls-Royce, reports that “we now have automated engine health monitoring data downloads for the G450, G550 and G650. This capability will soon be extended to Globals as well. The automated download means we



The Rolls-Royce AE3007 shares the top spot among turbofans.

have data within minutes of the conclusion of a flight compared to waiting 30 days for a manual download.” The Rolls-Royce authorized service center network has grown, with additions in Dubai, Brazil, Malaysia, Singapore, Australia and

### 2015 Average Ratings of Engines

Manufacturer	Model	Overall Average 2015	Overall Average 2014	Ratings Change 2014 to 2015	Factory Service Centers	Auth. Service Centers	Parts Availability	Cost of Parts	AOG Response	Warranty Fulfillment	Technical Manuals	Technical Reps	Cost-per-Hour Programs	Overall Engine Reliability
<b>Turbofan</b>														
Rolls-Royce	AE3007	<b>8.3</b>	7.9	0.4	<b>8.5</b>	<b>8.6</b>	8.5	7.1	8.5	8.6	7.4	8.6	8.1	9.3
Williams	FJ44	<b>8.3</b>	8.0	0.3	8.1	7.7	<b>8.6</b>	<b>7.6</b>	<b>8.8</b>	<b>8.7</b>	7.6	8.1	<b>8.3</b>	9.2
Honeywell	HTF7000	8.2	<b>8.1</b>	0.1	7.5	8.5	8.1	6.3	8.6	8.6	7.4	<b>8.9</b>	8.1	9.5
Rolls-Royce	Tay	8.2	8.0	0.2	8.4	8.5	8.4	6.8	8.4	8.4	7.3	8.1	7.7	<b>9.7</b>
GE	CF34	8.0	7.7	0.3	7.5	7.7	8.1	6.7	8.2	8.0	7.8	8.4	8.1	9.5
Honeywell	TFE731	8.0	7.9	0.1	7.6	8.5	8.1	6.7	8.3	8.4	7.9	7.8	7.4	8.8
P&WC	PW500 series	8.0	7.8	0.2	7.7	8.2	8.3	6.6	8.1	8.2	8.1	8.4	7.5	8.7
Rolls-Royce	BR700 series	8.0	8.0	0.0	8.0	8.1	8.3	6.7	8.4	8.5	7.4	8.2	7.4	9.1
P&WC	PW600 series	7.9	7.8	0.1	7.6	7.7	8.2	6.6	8.2	<b>8.7</b>	8.1	8.5	6.8	8.8
P&WC	JT15D	7.8	7.2	0.6	8.1	7.9	7.8	6.1	7.2	7.5	<b>8.3</b>	8.6	7.1	9.0
CFE	CFE738	7.7	7.6	0.1	7.7	8.3	7.8	6.7	8.5	7.7	<b>8.3</b>	8.0	5.9	8.1
P&WC	PW300 series	7.7	7.6	0.1	7.7	8.0	8.0	6.7	7.5	7.9	7.6	8.0	7.2	8.6
<b>Turboprop/Turboshaft</b>														
Honeywell	TPE331 turboprop	<b>8.6</b>	<b>8.5</b>	0.1	<b>8.3</b>	<b>9.1</b>	8.2	6.8	<b>8.7</b>	<b>8.5</b>	<b>9.2</b>	<b>9.2</b>	<b>8.5</b>	<b>9.6</b>
P&WC	PT6A turboprop	7.8	7.7	0.1	7.0	7.8	8.2	6.7	8.0	7.8	8.1	8.1	6.7	9.1
P&WC	PT6T/B/C turboshaft	7.8	7.5	0.3	6.6	6.5	<b>8.5</b>	<b>7.4</b>	8.0	<b>8.5</b>	8.3	7.8	6.4	9.0
P&WC	PW200 series	7.6	7.6	0.0	7.5	7.1	7.8	6.8	8.4	7.1	7.0	8.4	6.5	8.6
Turbomeca	Arriel	7.3	6.5	0.8	7.9	7.6	7.4	6.4	8.1	6.9	7.2	7.9	6.0	7.5

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*Engine manufacturers are constantly making improvements to their products and processes to ensure smooth operations for customers.*

Nigeria taking the worldwide roster beyond 55. “We have added On Wing Care technicians in Luton, Dubai and Beijing, adding to those already in North and South America, for a total of 45 technicians.

“Our parts distribution network continues to expand, with additional sites in North America [California, Indiana and Georgia] and Europe [the UK and Germany], along with planned additions in the Middle East [Dubai] and Asia [Hong Kong]. We can now deliver a part to a customer within 16 hours of receiving the order anywhere in the world.

Continued expansion of our Operational Service Desk capability [a new facility, more personnel and more capable proprietary IT tools] has recently enabled us to realize

our monthly KPI [key performance indicators] goals of 100 percent averted missed trips and AOG resolution within 24 hours.”

### GE

Tom Hoferer, general manager of commercial, service and support for business and general aviation at GE Aviation, says his company is “focusing on three core imperatives.”

First, “elevating the customer experience.” Last year the division overhauled its customer web center and diagnostics reports. “The feedback was that our tools and reports were complex and not intuitive to use. Focused on simplifying the experience, the new ‘myGEAviation.com’ site provides a customizable, easy-access portal directly linked to a customer’s

assets. Customers now have easy access to all their related documents such as technical publications, fleet highlights and so on. With the intent to make information more meaningful, much care has been invested towards ensuring that users are provided with information that helps

them with their work.”

The new diagnostic reports are “easy to read and [highlight actions that need] to be addressed. For a new customer today, it’s much simpler to gain access—63 percent fewer questions, just six required fields, no GE contact or sponsor questions and simultaneous access to multiple portals.” The new portal is also designed for ease of use, requiring “half the number of clicks and 80 percent less planned downtime, thanks to a proven, stable digital backbone. Much of this simplification can be attributed to the increased rigor that GE has invested [in] customer engagement and listening sessions.”

Second, “Ensuring Rapid Response.” GE says it is “focused on driving regional alignment to support our customers no matter where they are in the world. We have dedicated field service engineers worldwide, and this year we have expanded this organization by 33 percent. We have grown to 30 authorized service center network members, and the last seven additions have been outside the U.S.”



*The CF34 has logged more than 80 million flight hours and GE claims reliability of 99.99 percent.*

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This year, Lufthansa Technik Aero Alzey, BAS Singapore and Dallas Airmotive Singapore joined the network, and, the company said, “we are considering adding several international ExecuJet locations.”

Customers have “24/7 access to GE’s global support network, where multilingual representatives are on hand to serve them. Our metrics around AOG responsiveness have continued to trend higher. Over the past 12 months, 95 percent of all AOGs were resolved in less than two hours (versus four hours in 2014). Our delivery times on parts or customer fill rates are averaging 98 percent so far this year. One of the contributing factors has been a radical reorganization of the customer support and service functions at GE Aviation, where the BGA team now has total organizational ownership of its customer and product support team.”

Third, “Enhancing Engine Life-Cycle Value.” The CF34 “is world class with 99.99-percent reliability, enhancing aircraft availability.” [GE defines the figure of 99.99 percent as “a departure reliability metric based on a rolling 12-month window. The percentage is based on the total number of incidents of ‘no departure’ out of the total. So, in short, we had one incident in the past 12 months in the bizjet fleet for all models of the CF34.”]

“We continue to increase the scope of coverage and benefits for our OnPoint customers. [OnPoint for BizJets is GE’s engine maintenance and support program for business aircraft.] The coverage includes complete program management by an OEM expert, scheduled and unscheduled maintenance, line maintenance, transportation, loaner engines and diagnostics.” OnPoint coverage is now in effect for 40 percent of GE-powered



*Honeywell’s improvements to HTF7000 components are expected to yield a significantly smaller “reject” rate.*

business jets, compared with 20 percent five years ago. “Aircraft valuation companies attribute up to a \$2 million increase in residual value for customers with GE’s OnPoint service agreements on their engines.”

### Honeywell, CFE

Honeywell and its Global Customer Committee (GCC) worked together to improve the turbofan inspection criteria for the AS907/HTF7000 compressor and impeller blades.

## SURVEY RULES AND METHODOLOGY

As with AIN’s previous annual Product Support Surveys, the objective this year was to obtain from the users of business jets, turboprop airplanes and turbine-powered helicopters statistically valid information about the product support provided by business aircraft manufacturers over the last year and to report this information to our readers. The ultimate goal of the survey is to encourage continuous improvement in aircraft product support throughout the industry.

This survey was conducted via a dedicated website, created by AIN from the ground up to provide improved ease of use and to encourage greater reader participation.

AIN emailed qualified readers a link to the survey website and questionnaire. In total, 16,338 readers were invited to participate in the survey.

The survey website was open from May 4 to June 12. Respondents were asked to rate individual aircraft and provide the tail number, age (less than 10 years old or more than 10), primary region of service and whether they used factory-owned or authorized service centers, or both. Respondents were also asked to rate, on a scale from 1 to 10, the quality of service they received during the previous 12 months in the following categories:

- **Factory-owned Service Centers**—cost estimates versus actual, on-time performance, scheduling ease, service experience.
- **Authorized Service Centers**—same as above.
- **Parts Availability**—in stock versus back order, shipping time.
- **Cost of Parts**—value for price paid.
- **AOG Response**—speed, accuracy, cost.
- **Warranty Fulfillment**—ease of paperwork, extent of coverage.
- **Technical Manuals**—ease of use, formats available, timeliness of updating.
- **Technical Reps**—response time, knowledge, effectiveness.
- **Cost-per-hour Programs**—cost vs. benefits, ease of administration.
- **Overall Product Reliability**—how the product’s reliability and quality stack up against the competition.

Respondents were also asked to recognize individuals who have provided them with exceptional product support and service. The list of these people is available online at [www.ainonline.com/above-beyond-2015](http://www.ainonline.com/above-beyond-2015).

The 2015 AIN Product Support Survey results for aircraft and avionics were published in the August and September issues, respectively. ■

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“Analysis of removed compressor components found that the allowable accept/reject criteria could be greatly expanded,” said product support engineer Mathew Williams. As a result, Honeywell expects to see a “dramatic” reduction in the reject rate during the scheduled 8,000-hour compressor inspections for the Challenger 300 and 350, G280 and Legacy 450 and 500.

Recently, Honeywell has added FOD damage protection to its maintenance service plan (MSP) extended coverage. Modern aircraft engines can suffer major damage from ingesting even small objects. By some estimates, Honeywell reports, FOD “costs the global industry \$13 billion per year worldwide in both direct and indirect costs. Honeywell’s new ‘gap’ program covers wear and tear items replaced in the course of an FOD repair that are not otherwise covered by airframe FOD insurance policies. Engines eligible for the new FOD gap coverage include any TFE731, TPE331 or HTF7000 series engine, as well as APUs, in good standing on Honeywell’s MSP programs that has a FOD event on or after January 1 this year. CFE engines are not currently included in the program.” Lucy Martinez, with MSP aftermarket sales, noted, “Honeywell MSP customers don’t need to do anything to their existing contracts to receive this new coverage.”

Reliability and maintenance enhancements for the TFE731-20/40/50/60 and HTF7000 series have been introduced this year, among them new composite fan bypass stator vanes with a metal leading edge to improve vane durability; and a software

program to help reposition TFE731-50 fan blades in the disk to lower the fan’s acoustic buzz saw noise and reduce wear and tear on the inlets.

Dallas Airmotive received approval from the Brazil’s ANAC to perform line maintenance on HTF7000-series engines at its regional turbine engine repair facility in Belo Horizonte. Honeywell just launched an interactive mobile app and website to provide cus-



*On its in-development PW800 engine that will power the G500 and G600, Pratt & Whitney Canada will build on the technology in the popular PW500/600 series.*

tomers with the freshest information on its engines and APUs.

### Pratt & Whitney Canada

P&WC singles out its three key product-support initiatives as “speed, simplicity and product performance.”

In the quest for speed, “again this year, we are enhancing our Customer First Center by expanding the team supporting the PW300 and PW500 series, effectively doubling our capacity to respond to customers’ engineering and technical groups.

We have recently added mobile repair team (MRT) capability in both Australia and Singapore to provide full support for the Asia-Pacific region. This latest addition to our MRTs (Luton, UK, supporting the EMEA region; Sorocaba, Brazil, supporting South America; and 13 independently located teams in the U.S. in addition to the teams in our regional centers supporting North America) means that we now offer full MRT cover-

age in all corners of the globe. We now have 130 certified technicians enabling rapid on-wing maintenance support, which minimizes aircraft downtime.” Initiatives introduced last year and the commissioning of a new distribution center in Europe have driven down engine rental shipping time by 10 percent.

For simplicity, Customer Portal 2.0, currently under construction, will introduce “an industry-leading online parts-ordering functionality” among other things. The ESP Platinum level of coverage that was

introduced for the PW307A last year has been extended to include the PW308C. This includes parts and labor for routine periodic inspections, corrosion coverage, low-level utilization inspections, technical publications and enhanced engine trending and performance margin analysis. The PT6A “value overhaul” and hot-section inspection programs have been renewed this year, providing operators with “up to \$100,000 in savings.” As a maintenance promotion for PT6 and turboshaft engines, P&WC has developed “PT6Smart” programs for specific PT6As, among them a 1,000-hour engine-exchange program for the PT6A-21, PT6A-41 and PT6A-42; a flat-rate engine-exchange program for the PT6A-27, PT6A-28 and PT6A-34; an engine-upgrade program for the PT6A-114; and an extended-warranty option for all PT6As.

The company has also expanded the P&WC Smart initiative it launched at Heli-Expo this year to provide turboshaft operators with maintenance options that “enhance value throughout the complete engine life cycle.” Among the options: a refresh program for the PT6T-3 and T400; a barrier filter upgrade for the PW200 series; a PT6B-A/B engine flat-rate overhaul; and a PT6B-37A capped-cost hot-section inspection and overhaul.

Under “product performance,” P&WC says it has expanded its diagnostics, prognostics and health management (DPHM) suite to include STCs for its flight data acquisition storage and transmission (Fast) system for the ATR 42, ATR 72 and AW139. “Fast will

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*Turbomeca says it has improved repair turnaround time for the Arrius by 40 percent since 2012.*

securely transmit the key engine and aircraft data via global cellular wireless service to P&WC's ground system, which then distributes data to WebEC for easy web access, automated trend data updates and automated e-mail event notifications. After every flight, Fast transfers (either direct to the operator or to its selected analytics center) the FDR data for an operator's FOQA requirements. Upgrades to legacy systems are available with associated incentives."

For regional turboprops, P&WC "improved a key cyclic life part for the PW150 to synchronize all the life-limited parts, thus optimizing sub-life and in turn reducing operating costs. We also implemented a fuel-nozzle initiative for the PW100 series that significantly reduces on-wing replacement time. Finally, a PW150 No. 29 bearing was introduced for improved durability."

For turbofans, P&WC introduced a new PW500 accessory gearbox seal "that reduces the burden of unplanned

maintenance. Development of our DPHM suite now allows for PW307/PW308 compressor pressure ratio trending that complements traditional ECTM methods for improved proactive health monitoring. The PW306A bleed valve system was upgraded, significantly increasing its durability. This upgrade replaces the solenoid, harness and in-line P3 filter." TBO intervals for the PW200 have been raised to 4,000 hours from 3,500, and TBOs for some PT6As have been upped by 10 percent. "We also released BOV pneumatic sensing redesign on the PT6A-67F to eliminate inspections."

### Turbomeca

The French engine maker says that, for the third consecutive year, "Our AOG delivery performance has consistently exceeded 95 percent and our parts service rate 90 percent. We also tightened our parts routine order delivery time to five days from 15.

The company says it dedicated much effort last year to improving

its engine repair turnaround time (TAT) and FCU/HMU repair service rate. "Arriel and Arrius TAT was reduced by 40 percent from 2012 levels and we delivered 20 percent more FCU/HMU repairs than in 2013. As a consequence, the availability of our pool of FCU/HMU reached 95 percent during the last quarter of 2014. Last year the TBO for the Arriel 2S2 was extended to 3,850 hours, and for the Arriel 1E2 FCU to 3,600 hours."

In March this year, Turbomeca announced it will modernize its Tarnos plant, which is occupied mainly with customer support and MRO work. It will gain four new buildings, and two existing buildings will be revamped and expanded to 323,000 sq ft/30,000 sq m. The facility is slated for completion by 2020.

Turbomeca says it has 1,800 customers that operate fewer than five helicopters. "These customers are important for us because they represent 80 percent of our customer base. With the Bell 505 entering service soon, the number of these

customers will double over the next 10 years. Taking advantage of the planned introduction of new light helicopters, Turbomeca will enlarge its support network to offer best-in-class service tailored to small fleet operators."

With 2,500 support employees already on staff, Turbomeca says it is now working on doubling, by the end of next year, the ranks of its distributors and factory-certified maintenance centers (CMCs) from the current 36 worldwide. It expects to have approximately 100 by the end of this decade.

Turbomeca says it recently entered the final testing phase of its Boost (Bank Of Online Services & Technologies) support program. "Developed in association with IBM, Boost is a platform of online integrated services, highly secured, which aims to help rotorcraft operators in their fleet management and their engine maintenance. The power of Boost lies in the interaction between the electronic engine logbook, the interactive electronic technical publications and the engine configuration management we control as the OEM."

This year, Turbomeca unveiled new warranty features for all new and current civil engine models. The Turbomeca Care Program "will provide additional warranty solutions and conditions for Turbomeca's engines throughout their lifecycle and answer important operator needs.

The new warranty conditions include a 400-hour increase in coverage for repaired equipment at no extra cost for customers." New warranty extensions will be offered, in hours or months, to align with customers' operational needs. □