

Product Support Survey

by Matt Thurber

In this year's **AIN** Product Support Survey, readers picked a new top-place turboprop finisher, Williams International, with an overall average rating of 8.4 (out of a possible 10). Williams's rating, up 0.3 from its 2017 results,

moved it up from last year's third-place to first place this year. In the ratings categories, Williams received high scores for technical manuals (8.6) and cost-per-hour programs (8.1) for its FJ44 engines.

Rolls-Royce saw a 0.1 increase in its overall rating this year, to 8.3, putting it in second place, the same as in 2017. Top ratings included the highest overall average for a turboprop, an 8.5 for the AE3007.

That engine also received high ratings for authorized service centers (8.7), parts availability (8.8), warranty fulfillment (9.1), and overall engine reliability (9.3).

GE moved into third place this year, down from last year's first place, with a slight drop in overall average to 8.2. GE scored a high rating for cost-per-hour programs for its CF34 engine (8.1).

Also in third place this year at 8.2 is Pratt & Whitney Canada, up 0.2 from last year's fourth place. P&WC engines saw top ratings for overall engine reliability (PW500, 9.3) and AOG response and technical reps (PW600, 8.9).

Honeywell is moving up in the rankings, having scored 8.0 this year, up 0.2 from last year, and a fourth-place ranking for turboprop manufacturers, up from fifth last year.

In the turboprop/turboshaft segment, Honeywell retained its first-place ranking with an 8.7 overall average, up 0.1 from last year's first-place finish. Honeywell's TPE331 received top scores in a number of categories, including overall average (8.8), factory service centers (9.1), authorized service centers (9.1), parts availability (8.7), cost of parts (7.2), AOG response (8.8), warranty fulfillment (8.9), technical manuals (9.1), technical reps (9.3), and the highest ranking for overall engine reliability (9.7).

P&WC sustained its second-place ranking with the same score as last year, 7.7.

Safran Helicopter Engines came in third with an overall average of 7.4, up 0.4 from last year. The company received the highest score (7.6) for cost-per-hour programs for turboprop/turboshaft manufacturers.



Williams International

What Have You Done For Me?

Engine technology changes slowly but inexorably, and one of the most significant changes in recent years has been the growth of sensors and data tools to help support modern turboprops. Engine manufacturers outline how they are using technology to support their products and other improvements made during the past year.

GE Aviation

GE's engine division is preparing for two significant entries into service, the Passport 20 turboprop that powers Bombardier's soon-to-be-certified Global 7500 ultra-long-range business jet and the Catalyst turboprop for Textron Aviation's single-engine Denali. The Global 7500 should enter service by the end of this year, and the Denali is scheduled for certification in 2020.

GE's main business aviation engine is currently the CF34, which powers nearly 1,200 aircraft, mostly the Bombardier

Challenger 601 through 650 and 850 models and Embraer's Lineage 1000.

The CF34 is a mature engine, but still has many years of life, with the latest version to enter service in business aviation the CF34-3B MTO for the Challenger 650.

The GE business aviation support network has grown during the past year, with new field service engineers in China, the UK, and Brazil, and more being hired next year for Mexico and Australia. The company added three new authorized service centers: ACI Jet in San Luis Obispo,

California, and Lufthansa Bombardier Aviation Services in Berlin and Moscow.

Although GE Aviation manufactures engines, airplanes powered by those engines are at risk for being able to fly much after the ADS-B mandates for the U.S. and Europe begin in 2020, so the company has been monitoring the fleet and helping its partner service centers open up installation slots for ADS-B upgrades, according to Jim Stoker, product support manager. He expects 80 percent of the business jet fleet powered by GE engines to have an ADS-B solution by the end of this year and the entire fleet by 2020.

CF34-powered Challengers, including those covered by GE's OnPoint maintenance and Prognostic Health Management (PHM) Plus programs, are eligible for installation of the Avionics miniQAR Mk III (quick access recorder) which was recently certified on Challengers. "This will breathe new life into this airframe," said Chad Harris, senior customer contract manager.

The miniQAR facilitates transmission of engine health monitoring data, times,

and cycles once on the ground, via Wi-Fi networks at FBOs or cellular networks. Data—both for health monitoring and flight operational quality assurance—is sent to Austin Digital for analysis and sharing with the operator, GE, and maintainers designated by the operator.

GE's sales team works closely with Bombardier to encourage Challenger operators to sign up for OnPoint and PHM Plus. "We work together to bring that value to customers and the market," said Harris, which helps get their airplanes back flying faster when there is a problem.

To further speed up response, GE's Aviation Operations Centers (AOC) in Cincinnati, Ohio, and Shanghai, China, are open around the clock. "Our goal is to respond within two hours," said Stoker, "but we've been running at 90 minutes in the last 18 months." When an AOG crops up, the AOC dispatches the issue to a team on the ground near where the aircraft is grounded.

GE puts the data gathered by health-monitoring systems to work to



drive improvements to its engines. “The more data we have available, that facilitates us being able to move more quickly to respond,” he said. And when that data highlights a trend, GE engineers can develop a fix.

“What we’re focused on from the engine support standpoint,” Harris said, “is close to real-time access to data. Before, it would be a monthly download. Now after every flight that data is transmitted wirelessly, and we can plot it closer to real time. We have that historical data, and we can respond with speed.”

GE calls this continuous engine operational data. “Now, instead of a snapshot at takeoff,” he said, “we have cruise data to troubleshoot that event.” This eliminates the need to conduct a test flight with monitoring equipment to try and capture details of a problem.

Newer engines such as the Passport and Catalyst have more sensors built-in and generate much more data, which increases the opportunity to analyze problems. These engines enable a new capability, for GE to build “digital twin” versions of each engine, which are physics-based models of each engine from birth through the entire lifecycle. This allows GE to track performance of engines and individual parts and compare them to others in the fleet; and to a nominal digital model using GE’s big-data analytics techniques.

Meanwhile, training is under way for technicians preparing for entry into service of the Passport 20 in the Global 7500, including technicians at Bombardier, GE, and Lufthansa Technik, to support the engine anywhere in the world.



GE Aviation

2018 Overall Average Ratings of Engine Manufacturers

	Overall Average 2018	Overall Average 2017	Ratings Change from 2017 to 2018
Turbofan			
Williams	8.4	8.1	0.3
Rolls-Royce	8.3	8.2	0.1
GE	8.2	8.3	-0.1
Pratt & Whitney Canada	8.2	8	0.2
Honeywell	8.0	7.8	0.2
CFE	7.9	7.4	0.5
Turboprop/Turboshaft			
Honeywell	8.7	8.6	0.1
Pratt & Whitney Canada	7.7	7.7	0.0
Safran Helicopter Engines	7.4	7	0.4

Companies listed in order of 2018 overall average. Ties listed alphabetically by manufacturer.

2018 Overall Average Ratings by Individual Engine

		Overall Average 2018	Overall Average 2017	Ratings Change from 2017 to 2018	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
Turbofan														
Rolls-Royce	AE3007	8.5	8.5	0.0	8.4	8.7	8.8	7.7	8.7	9.1	7.8	8.6	7.8	9.3
GE	CF34	8.3	8.3	0.0	8.0	8.1	8.2	7.4	8.7	8.6	8.4	8.6	8.1	9.1
Williams	FJ44	8.3	8.1	0.2	8.1	7.7	8.3	7.3	8.4	8.6	8.6	8.8	8.1	9.1
P&WC	PW300 series	8.2	7.9	0.3	8.3	8.5	8.3	6.9	8.2	8.7	8.3	8.5	7.7	9.0
P&WC	PW500 series	8.2	8.2	0.0	8.4	8.4	8.1	6.9	8.3	8.5	8.0	8.6	7.3	9.3
P&WC	PW600 series	8.2	8.1	0.1	8.3	8.0	8.2	6.8	8.9	8.3	8.0	8.9	7.2	9.0
Rolls-Royce	BR700 series	8.2	8.2	0.0	8.7	8.7	8.4	6.4	8.5	8.6	7.5	8.3	7.3	9.3
Rolls-Royce	Tay	8.2	8.1	0.1	8.4	8.2	8.7	6.6	8.6	8.0	8.2	8.1	7.7	9.3
Honeywell	HTF7000	8.1	7.8	0.3	7.5	8.4	7.9	7.0	8.6	8.5	8.2	7.6	7.6	9.2
Honeywell	TFE731	8.0	7.8	0.2	8.2	8.3	8.1	6.6	8.4	8.6	7.8	8.1	7.3	8.9
CFE	CFE738	7.9	7.4	0.5	7.8	7.6	8.1	7.1	7.3	8.4	8.3	8.5	6.6	9.3
P&WC	JT15D	7.7	8.0	-0.3	7.8	8.2	7.7	6.0	7.8	7.5	8.1	8.0	7.1	9.1
Turboprop/Turboshaft														
Honeywell	TPE331 turboprop	8.8	8.7	0.1	9.1	9.5	8.7	7.2	8.8	8.9	9.1	9.3	7.3	9.7
P&WC	PT6A turboprop	7.8	7.6	0.2	6.4	7.7	8.1	6.6	7.7	7.8	8.2	8.1	6.8	9.1
P&WC	PW200 series turboshaft	7.7	7.7	NA	7.4	7.9	7.5	5.6	7.4	7.1	8.4	8.1	7.2	8.2
P&WC	PT6T/B/C turboshaft	7.5	8.0	-0.5	7.0	6.8	7.4	6.7	7.4	7.7	8.1	7.5	7.3	8.8
Safran	Arriel	7.4	7.2	0.2	6.4	6.9	7.5	5.9	7.3	7.5	8.1	7.6	7.6	8.5

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Honeywell

“We’re continually trying to make things easier for customers,” said Rich DeGraff, vice president of customer product support for business aviation. Honeywell’s key business aircraft engines are the TFE731 that powers many legacy and modern business jets and the HTF series.

Two areas of focus for Honeywell are to continuously improve engine reliability and make it easier for customers to contact the right person at Honeywell to resolve any problems.

“We’ve been increasing [maintenance] intervals,” said DeGraff, “and we’re always looking at that across all the models.”

Factors that help Honeywell improve engine reliability and extend intervals are data generated by the engine and Honeywell’s push toward connectivity, which makes transmitting and sharing engine health data more efficient. “Honeywell is uniquely positioned because we do avionics and engines, areas where we can get that data quickly. We see no limit on how we get that data and use those insights to drive further technological advancements,” DeGraff said. “The HTF is great for that, and we’re gaining insights regularly from those who fly it. And we’re driving [that information] into our roadmaps for improved functionality [and reliability]. We’re definitely generating great insights into how the engines are performing and where we can see through performance how we can extend intervals.”

For the TFE731, he said, “it’s clearly had a very long run, but we still see a lot of operators love that engine. Given the platforms that they are on, and the aircraft



that fly [with that engine], there are some areas where it's going to have quite a bit of runway [remaining] and others where the aircraft it's on is getting replaced. But it serves a certain need that has some legs on it. It's still important to us, and to our customers and is still being supported. We don't see any change in that."

Honeywell has also made an effort to expand its bank of rental engines. "We're constantly optimizing that so we have engines in the right place where customers need them," he said. To make the process of getting a loaner engine faster and simpler, Honeywell recently devised a digital bailment agreement, so paperwork doesn't have to be signed and sent to various parties. Now the customer can sign the bailment agreement and submit it using a smartphone.

To help improve communication with customers, Honeywell launched a campaign to make sure customers are connected with and know how to contact their local field service engineers. "We feel this relationship is important," he said. To further this relationship, customer support managers reach out to customers periodically to ask about engines' performance and find out if there are any problems that need to be addressed. "We're taking a proactive approach instead of waiting," DeGraff said.

Honeywell has redesigned its Direct Access mobile app to make it easier for customers to reach a subject matter expert. Its MyAerospace portal provides technical information, updated publications, and knowledge articles as well as AOG support. Much of the digital access that Honeywell offers is informed by its Global Customer Committee, with



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representatives from aircraft operators helping Honeywell understand what they need.

"Our network is performing quite well," DeGraff said, "with great partnerships, relationships, and the advisory board of our channel partners sharing customer feedback about where our customers are going, and using that information to make sure we're well positioned to support our customers."

Pratt & Whitney Canada

Pratt & Whitney Canada (P&WC) product support efforts are designed to help customers "achieve even greater availability, more fully planned maintenance environments, lower maintenance costs,

and service guarantees."

Availability is improving due to new ways of adopting technology to the service side of P&WC's business. One way that the company is doing so is through "transformation teams." P&WC gives these teams the tools and freedom to develop solutions to problems faced by the company's more than 13,000 customers.

A result of the transformation teams' efforts is new features and services added to the Eagle Service Plan (ESP) pay-per-hour program.

One example applies to PW307As operated on ESP, and it offers reliability upgrades at no extra charge while the airplane is down for a C check. "This includes the incorporation of four service bulletins as part of the company's ongoing efforts to move customers to fully planned environments," according to P&WC.

PW306D1 engines enrolled in ESP can now be maintained on-condition instead of at fixed intervals. Engine condition is evaluated via digital engine health trending tools. These engines also enjoy a lower ESP rate.

Owners of PW307A, 307D, and 308C engines in the ESP Platinum program can carry free flyaway kits containing key components to carry on the airplane, speeding up problem resolution when these parts are needed.

Helicopters flown in oil-and-gas operations can take advantage of the new LRU availability program, which positions LRUs and other parts onsite at the customer's location. P&WC is considering expanding this by providing LRU pooling at key locations.

P&WC is expanding resources for operators in Africa, with a new

Survey Rules and Methodology

As with AIN Publications' 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 manufacturers of business aircraft, avionics and engines 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 also sent a postcard invitation with login credentials to the survey website.

The survey website was open from May 1 to June 9. Respondents were asked to rate their aircraft's engines and to indicate the region where these products are normally serviced. 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 time, 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 versus benefits, ease of administration.
- » **Overall Engine 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 full list of these people is available online at www.ainonline.com/above-beyond-2018.

The 2018 AIN Product Support Survey aircraft results were published in the August issue, and the avionics results were featured last month. ■



Pratt & Whitney Canada



subscriber-based engine rental pool for PT6A and PW150 engines. Four mobile repair teams are available to help support the more than 3,000 P&WC engines in Africa.

“We’re helping customers overcome logistical and operational challenges and keep them flying by increasing rapid access to parts, engines, and mobile repair team support,” the company said.

P&WC is committed to digital connectivity to support its products. The company’s Proactive Help Desk, which is part of Digital Engine Services, uses data from P&WC’s Fast prognostic system in near real-time to improve availability and lower unplanned maintenance. The PW307 in the Falcon 7X and 8X had a dispatch availability rate of 99.94 percent, but in the past year, the Proactive Help Desk has moved that up to 99.98 percent. The amount of “unplanned maintenance related to these key availability drivers” for those engines on the ESP program dropped to 20 percent from 85 percent, according to the company.

The Fast solution is being certified on more aircraft, including in the past year the Beechcraft King Air and Pilatus PC-12 and Air Tractor agricultural aircraft.

Operators can take advantage of P&WC’s oil analysis, now available on several of its engine models. P&WC says its technology is more sensitive than competing oil analysis products and that it “can detect events up to hundreds of hours in advance” and “identify carbon seal deterioration, which can lead to smoke in the cabin.”

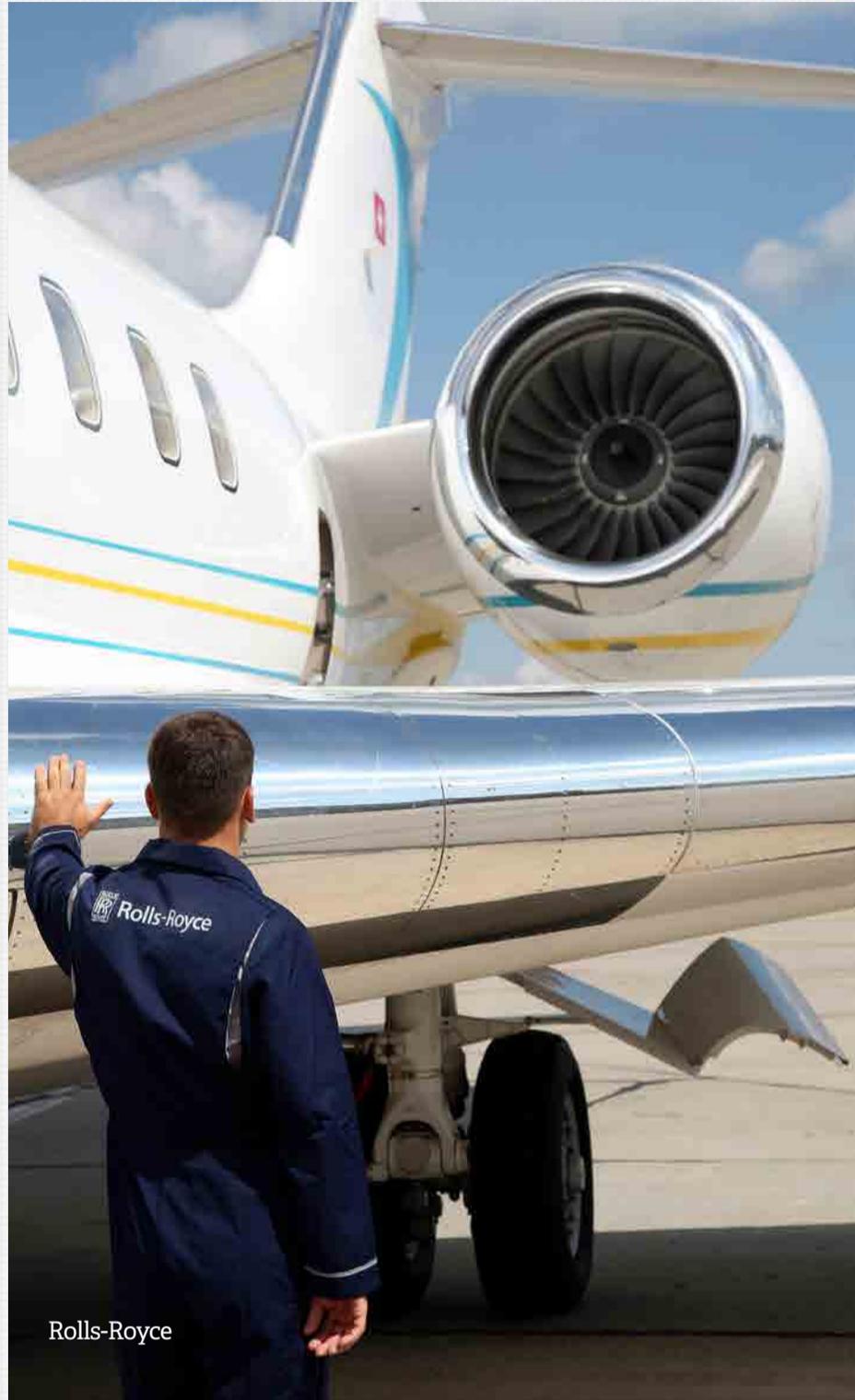
All of P&WC’s digital engine services can be accessed via its MyP&WC Power web portal, including “oil analysis results, engineering services, parts purchasing, and online maintenance manuals.”

In the past year, P&WC has established three new designated maintenance facilities in Brazil, and it now has a network of more than 30 owned and designated facilities worldwide. The P&WC customer service organization employs more than 3,000 people.

Rolls-Royce

“We’ve spent a lot of time talking to customers and why they buy business aircraft,” said Andrew Robinson, Rolls-Royce senior vice president services and customer support. “It’s to be a time machine, to go when and where they want. Having the aircraft available at all times is key, and we formed an availability team and center, which is open 24/7. This ensures that the customer can fly when they want to.” The center is located in Dahlewitz, Germany.

Earlier this year, Rolls-Royce launched its new Availability app (iOS and Android)



for CorporateCare customers. When an AOG occurs, customers can quickly submit a request that includes videos and photos and the location of the event. As Rolls-Royce deploys resources to solve the problem, the customer and other designated personnel are updated on the recovery efforts via the app, for example, tracking parts and technicians, when cowl doors are opened and closed, engine run completed, and when the job is done. “This allows us to communicate quickly,” he said, “get data much quicker, and launch our teams.” The app was developed from feedback provided by the Rolls-Royce Corporate Customer Council (C3).

More CorporateCare customers are flying connected aircraft and this enables Rolls-Royce to capture engine health monitoring data either after the flight, or during flight on airplanes like the

Gulfstream G650. “This enables us to be proactive,” Robinson said, “and identify issues before there is a problem and it disrupts the flight.”

Rolls-Royce’s new Pearl 15 turbofan, which powers the upcoming Bombardier Global 5500 and 6500, steps up monitoring capabilities with a new engine vibration health monitoring unit (EVHMU) that measures thousands of engine and LRU parameters. What is different about the EVHMU is that it not only tracks engine parameters but also engine accessories, for example, if a valve or solenoid is slow to respond, Robinson explained.

The EVHMU also allows two-way communication with the engine and LRUs, he said, “so we can interrogate the engine’s computer remotely, and monitor ground runs from a remote location. There is much more information in real time so we

can make faster decisions. The majority of aircraft AOGs are around accessories, and historically they have never been measured effectively though EHM. It’s a massive step forward.”

Rolls-Royce’s dedicated business aviation on-wing services team has grown by 20 percent at 16 locations worldwide. The company’s service center network now includes 75 facilities, all connected via a web-based tool that speeds up processing of CorporateCare work. A new rotatable return feature speeds up repairs of rotatables.

Last month, Rolls-Royce opened a new parts store in Beijing to support CorporateCare customers in China. Parts are pre-cleared to serve China-based aircraft, eliminating days of recovery time if parts had to get shipped from elsewhere.

“Most of this is around speed of response,” Robinson said. “We’re very focused on that. The goal is to rescue an aircraft anywhere in the world in less than 24 hours, and we’re achieving that.”

To achieve these goals, Rolls-Royce’s support team is applying some creativity. After taking care of an AOG involving an engine change on a remote island with little infrastructure, he said, “that got us thinking what we can do.”

The team designed an inflatable igloo-like structure that wraps around the airplane’s tail, with heat, lights, and a generator, allowing technicians to work in comfort in a hostile environment. The igloo folds into a package smaller than a spare Rolls-Royce engine. “We’re doing trials with it now,” Robinson said.

Williams International

In July Williams International moved from its factory in Commerce, Michigan, to its new 150-acre world headquarters in Pontiac. “The transition to our new headquarters provides us the ability to further accelerate our rapid pace of new product development, expand our product support capabilities, and provide a world class environment for our team to work and grow in the future,” the company said.

At the new facility, Williams is accelerating development of new products and expanding its product support capabilities. A key feature of the transition to the new headquarters is an expansion of owner, operator, and technician training in a new “ultra-modern” training facility “so they can better understand and enjoy our engines,” the company said.

Williams support 5,700 FJ44 and FJ33 engines, and most owners/operators are enrolled in the company’s TAP Blue (Total Assurance Program) pay-per-hour program, which also covers foreign object damage. ■