



# Moving Ahead

Aerospace Systems and Components

**aerospace**  
climate control  
electromechanical  
filtration  
fluid & gas handling  
hydraulics  
pneumatics  
process control  
sealing & shielding



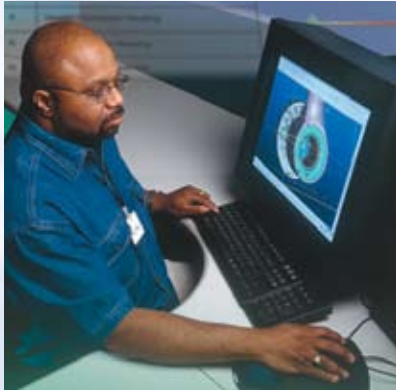
ENGINEERING YOUR SUCCESS.



It's value first,



# value fast at Parker Aerospace



- Shorter lead times.**
- Lower costs.**
- Higher reliability.**
- Shared risk.**

Big changes are happening in the aerospace industry: changes that require new approaches to the business of flight.

Parker Aerospace is responding in kind.

As a world leader in flight control, hydraulic, fuel, fuel tank inerting, fluid conveyance, engine, pneumatic, and heat management systems and components, we've gone from provider to partner. From design and development through integration, manufacture, certification, and lifetime support, we're adding value to both the process and the product.

Backed by the significant resources of Parker Hannifin Corporation, the world leader in motion control technologies and systems, we have the talent, resources, and infrastructure needed to move ahead. Which means we're ready to provide the technological edge, integrated systems, customer service, and low cost of ownership our customers need and want.

System by system. Program by program. And market by market.





Aguata

Airbus

ATR

AVIC-I

BAE Systems

Bell Helicopter Textron

Eurocopter

General Electric

Goodrich

Gulfstream

Hamilton Sundstrand

Messier-Dowty

Microtecnica

Mitsubishi Heavy Industries

MTU Aero Engines

SAAB

Sikorsky Aircraft

Snecma

Sukhoi

Teledyne



**How Parker Aerospace is accelerating opportunity for commercial customers around the world**

Boeing    Bombardier    CASA    CFM    Dassault Aviation    EADS    Embraer  
Honeywell    IAE    Israel Aircraft Industries    Kaman Aerospace    Liebherr  
Pacific Scientific Aerospace Group    Pratt & Whitney    Raytheon Aircraft Company    Rolls-Royce  
Technologies    Thomson-CSF Sextant    Vought Aircraft Industries, Inc.

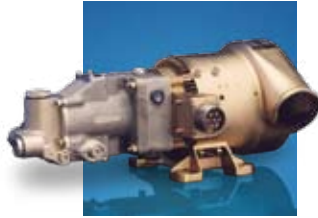
# The market: commercial

## Adding value: Supply chain management

Where will we go to procure the value our customers deserve? Mexico, China, Brazil, and the Czech Republic, to name just a few of the worldwide locations.

As experienced systems partners, Parker Aerospace looks to build customer advantage through strategic procurement. We have become skilled supply chain managers, identifying and overseeing a global network of subcontractors who can provide excellent quality at competitive costs.

As an example, we established a Parker subassembly manufacturing facility in Guaymas, Mexico, to help produce products such as the wiring harnesses for the A380 in a low-cost, high-performance manner.



A318, A320,  
and A321 electric  
motor-driven pump



Embraer 190 fly-by-wire  
rudder servoactuator



737 electromechanically  
actuated pneumatic valve



**Assembling value** – The Parker Aerospace facility in Guaymas, Mexico, is just one of our many worldwide locations dedicated to providing high quality at a low cost.



GP7200 fluid  
distribution system



Embraer 170/190  
solenoid-operated  
shutoff valve



2.5-inch ball valve  
with actuator



A340 500/600 and A400M  
engine-driven pump



A380 fuel quantity management system



Embraer 170/190 fuel boost pump

## Where we're going in systems: from design to dispatch

Partnering. Risk sharing. Shortened development time. Maturity at entry into service. Lifetime support. By collaborating in the aggregation of requirements development, design, integration, and certification of aircraft, Parker Aerospace is able to help its customers get their programs flying fast. And our lifetime support will help to keep them flying.

That's why you'll find us on programs like the Embraer 170/190 family of aircraft, providing the fuel, hydraulic, and flight control systems, as well as the Airbus A350, designing and producing its hydraulic, fuel, and fuel tank inerting systems.

As a long-time supporter of Embraer, we were one of the earliest partners identified for the program. And we are proud to partner with Airbus on its innovative composite jetliner.

All so Embraer and Airbus can stretch their wings. And airlines can stretch their profits.



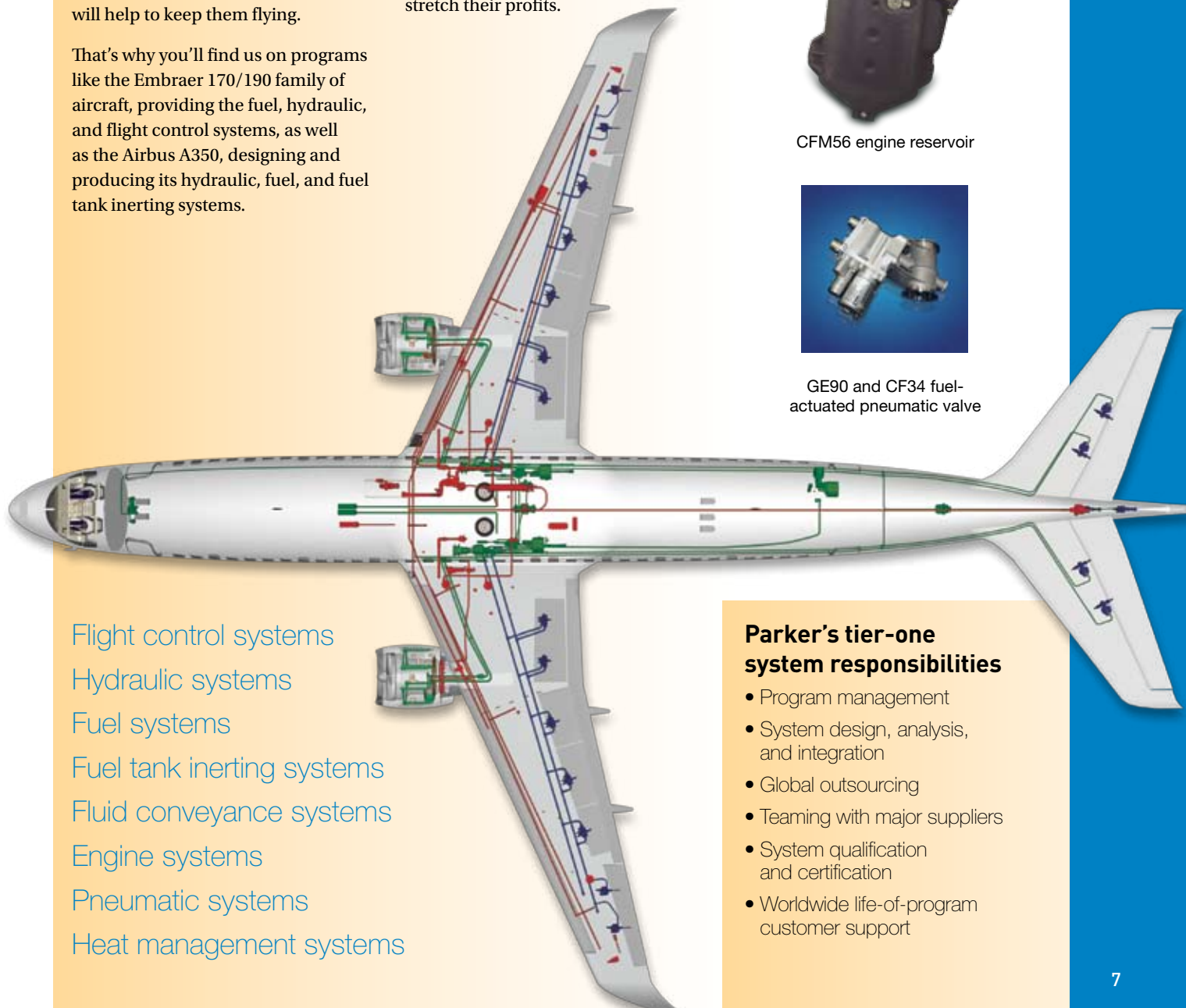
Embraer 190 horizontal stabilizer trim actuator



CFM56 engine reservoir



GE90 and CF34 fuel-actuated pneumatic valve



- Flight control systems
- Hydraulic systems
- Fuel systems
- Fuel tank inerting systems
- Fluid conveyance systems
- Engine systems
- Pneumatic systems
- Heat management systems

### Parker's tier-one system responsibilities

- Program management
- System design, analysis, and integration
- Global outsourcing
- Teaming with major suppliers
- System qualification and certification
- Worldwide life-of-program customer support

# The market: commercial



## Realizing the dream

The dream of global partnership is being realized in the Boeing 787 Dreamliner, a plane born of efforts from all over the world.

What's Parker's part? As a Boeing system team member, we're partnered to provide a 5,000-psi hydraulic system that's both lighter in weight and more cost effective to operate through the use of new technology and advanced materials. Our contribution includes hydraulic pumps, filter modules, reservoirs, accumulators, heat exchangers, maintenance components, and control valves,

as well as control and indication software that operates on the airplane's common core system. Other Parker Aerospace equipment includes the liquid cooling system, water pumps, and fuel metering units.

We also work closely with other 787 suppliers to provide advanced fuel nozzles on both GE and Rolls-Royce engines and the emergency power pack to the landing gear system.

Parker is committed to Boeing as a risk-sharing partner, from definition and specification, to design, integration, certification, and lifetime support.



A380 galley cooling quick-disconnect assembly



787 engine-driven pump



787 auxiliary power unit smart fuel pump



## Partnering: our role on the ARJ21

Parker Aerospace partners with all of its customers, finding unique ways to deliver the best solution and the best value. To get the ARJ21 off the ground, we're taking customer interface to a whole new level.



On site, on target – Parker works on site with AVIC 1 and regulatory authorities to help achieve airworthiness compliance.

Working with the AVIC 1 Commercial Aircraft Company of China, Parker is developing, integrating, building, testing, and providing certification and lifetime support for the fuel, hydraulic, and flight control systems on the ARJ21. We also will work on site with AVIC 1 and regulatory authorities to make sure that all systems are in compliance with airworthiness regulations.

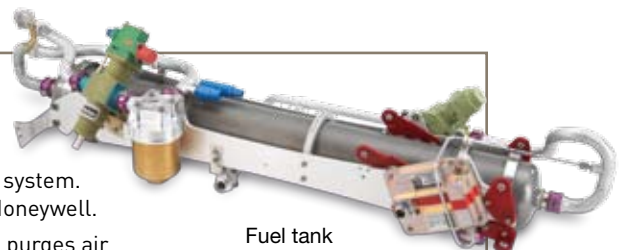
That's because at Parker, we know success depends as much on the human-ware as it does the hardware.

## Creating a nonflammable zone

Parker's proven inerting systems are used by commercial and military aircraft around the world for fuel tank safety. For example, the Airbus A400M military transport and all Airbus long-range and single-aisle aircraft include the Parker system. Boeing production aircraft also use a Parker system produced with teammate Honeywell.

Developed around a core technology of nitrogen generation, the inerting system purges air from fuel tanks using nonflammable nitrogen gas. It is a Parker technology built on 40 years of military and commercial inerting systems experience.

Our inerting pedigree: 737, 747, 777, A320, A330, A340, A400M, C-5, F-16, F117, F-22, C-17



Fuel tank inerting equipment





Trent 1000 pneumatic suite



## How our customers see us

“Boeing is pleased to have selected Parker as part of the 787 team. Parker continues to be a great partner, adding experience and value to the 787 program. Together we are creating an airplane that will be more comfortable for passengers and provide more value to our airline customers.”

**Mike Sinnett**  
787 Systems  
Life Cycle Product  
Team Leader  
Boeing 787  
Systems Team



### Revving up our engine work: risk sharing on the Trent 1000

How do you support engine innovation?

Sometimes, from the core out. The new Rolls-Royce Trent 1000 offers its customers reliable three-shaft architecture that has been flight proven with 35 million hours of experience. Parker engineering and project management teams are collocated at Rolls-Royce facilities, to speed responsiveness and performance, in our support of this important new program.

As a risk-sharing supplier on the Trent 1000, Parker Aerospace will have total lifetime aftermarket responsibility for its engine contributions. This will consist of several systems, including fuel nozzles and manifolds, start power coupling actuation, and pneumatics, as well as the heat management system, developed in concert with Sumitomo Precision Products.

Working on site with our customer reaps many benefits. Real-time communication means frank and fast dialogue at critical moments, resulting in improved responsiveness and meaningful partnerships, as well as better engine solutions from the standpoint of performance, reliability, and maintenance.



**Low burn, high performance** – Our fuel atomization system nozzles on the Trent 1000 help contribute to low fuel burn and high performance.



Trent 1000 heat management system

Electric motor-driven scavenge pump for technology demonstration on a more-electric engine



Want to lower your cost of ownership? Talk to us about customizing our worldwide support services to fit your operation.

Aermacchi Agusta Airbus Alenia ATK BAE Systems Inc. Bell  
Embraer Eurocopter France Ministry of Defence General Atomics General Dynamics  
Israel Aircraft Industries Italian Ministry of Defence Korean Aerospace Industries Liebherr  
NATO Northrop Grumman Orbital Sciences Pacific Scientific Aerospace Group  
Stork SP Aerospace Sumitomo Teledyne Technologies United



## Moving the military from status quo to status go

Helicopter Textron   Boeing   Dassault Aviation   EADS   EDO Corporation  
General Electric   Goodrich   Hamilton Sundstrand   Hanwha   Honeywell  
Lockheed Martin   Microtecnica   Mitsubishi Heavy Industries   MTU Aero Engines  
Pilatus   Pratt & Whitney   Raytheon Aircraft Company   Rolls-Royce   Sikorsky Aircraft  
Defense   Vought Aircraft Industries, Inc.   Williams International

# The market: **military**



## **Adding value: Parker Aerospace smart pumps**

Parker smart pumps do more than add value to the military effort. They add real intelligence.

In applications such as fuel boost, brake actuation, and transfer pumps on both military and commercial

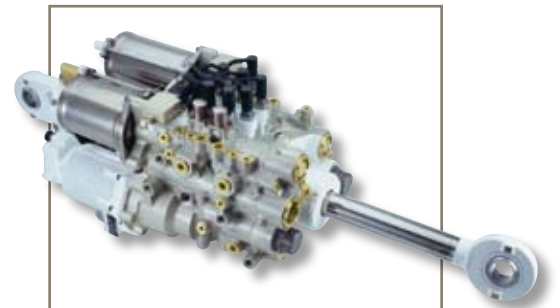


Smart pumps

aircraft, Parker smart pumps are capable of adjusting flow and pressure in response to system demand for optimum efficiency. They also interface with system control devices to monitor component health.

These brushless, electric, DC motor-driven pumps with sensorless electronic controls simplify system complexity, reducing parts, weight, and power consumption while enhancing both safety and system life. Flexible software routines eliminate costly hardware redesigns, support safety-critical applications, and facilitate the programming of current, velocity, and pressure with greater precision.

Pumps just don't get much smarter than that!



## **Power to the EHAs!**

In addition to its affordability, joint-service procurement, and unprecedented international collaboration, the F-35 Joint Strike Fighter features another major achievement. The aircraft is the first production fighter with a system of electrohydrostatic actuators (EHAs) powering all primary flight control surfaces.

EHAs are self-contained hydraulic systems controlled by high-power electronics. EHAs save weight at the aircraft system level and provide more effective performance, in the air as well as on the bottom line.



C-17 remote interface unit



F414 nozzle, spraybars, and manifold



F-22 fly-by-wire flight control actuator



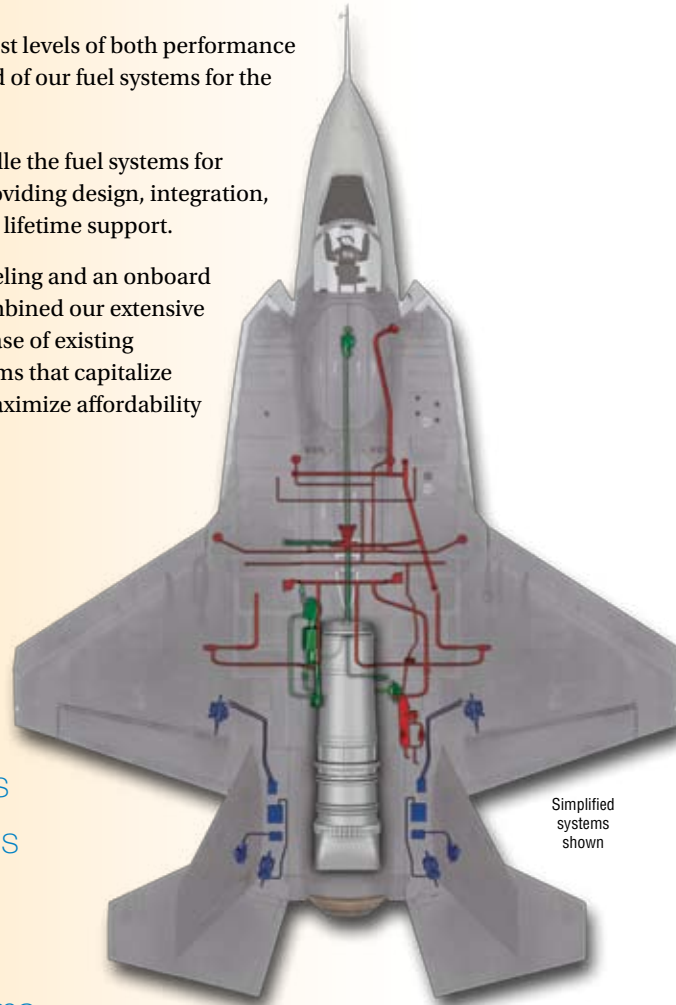
## Where we're going in systems: affordable performance

Military aircraft must deliver the highest levels of both performance and affordability. The same can be said of our fuel systems for the F-35 multi-role fighter.

Parker Aerospace was selected to handle the fuel systems for all three F-35 variants, where we're providing design, integration, and qualification assistance, as well as lifetime support.

From pumps and valves, to aerial refueling and an onboard inert gas generating system, we've combined our extensive fuel experience with our knowledge base of existing technology. The end result? Fuel systems that capitalize on commonality and technology to maximize affordability and performance.

- Flight control systems
- Hydraulic systems
- Fuel systems
- Fuel tank inerting systems
- Fluid conveyance systems
- Engine systems
- Pneumatic systems
- Heat management systems



SH-60 fuel transfer pump



UH-60 hydraulic power supply



Expeditionary Fighting Vehicle hydraulic pump



V-22 fuel breakaway valve



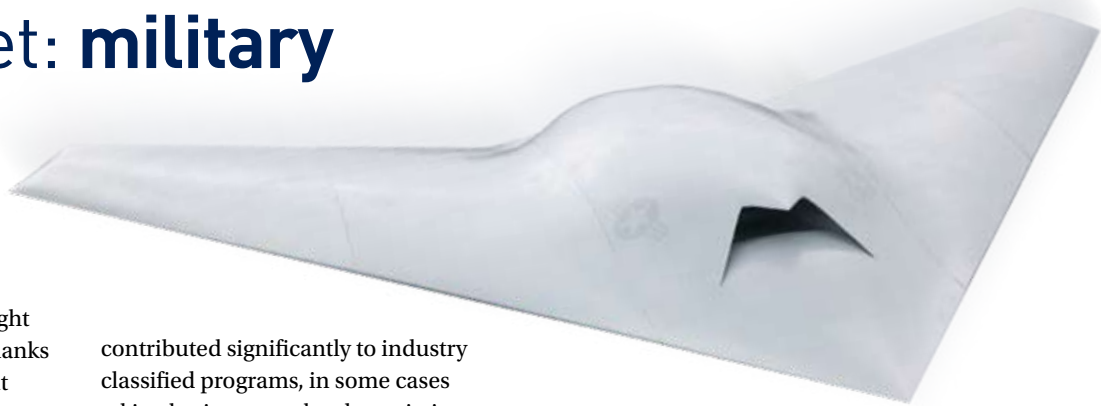
Aerial refueling product family



F414 fuel-actuated pneumatic valve



# The market: **military**



## **Partnering: our UAV contributions**

The future of military combat flight is looking decidedly different, thanks in large measure to the work that is being done in the unmanned aerial vehicle (UAV) market.

Parker Aerospace is an innovative leader here, providing systems and components support to a wide range of UAV manufacturers. Recognizing Parker's strength in emerging UAV technology, many leading aerospace companies have signed contracts with Parker on a variety of UAVs, including the Lockheed Martin P-175 Polecat demonstrator; the Boeing X-45C; the Northrop Grumman RQ-4A Global Hawk, X-47A, and X-47B; and the General Atomics MQ-9 Predator.

Parker's contributions on these innovative aircraft are significant: they range from the electromechanical flight control actuation system on the Polecat demonstrator, and the wingfold actuation system on the Northrop Grumman X-47B, to a broad array of subsystems and components on the other contracted programs.

## **Gaining ground: how we help get new programs up and running**

How do new ideas get off the ground? Often with the help of innovative thinking by supplier partners like Parker Aerospace. We have

contributed significantly to industry classified programs, in some cases taking brainware to hardware in just six months.

Our multifaceted pedigree is one reason why we're chosen for these programs. Parker's systems expertise and broad base of proven technology are matched by our willingness to do what it takes to get a program up and running, such as collocating wherever necessary. In addition, our capabilities make us uniquely qualified to participate in critical trade studies that define vehicle requirements through a balancing of power, weight, performance, and envelope size.



Nutlok® fitting for F136 distribution system



**Total teamwork** – Parker Aerospace and Lockheed Martin engineers work side by side on the Lockheed Martin fuel system simulator, to ensure quick and easy integration of Parker's fuel system on the JSF.



Electric valve and actuator



F-35 gun drive hydraulic motor



F-35 flaperon electronics control unit



Modular fuel system

# How our customers see us

“As a strategic supplier, Parker Aerospace is critical to our long-term success. The company has done an excellent job of aligning itself with our business and performance objectives, which has enabled us to work together toward the same goals through a sharing of best practices. By combining its business efficiencies with technical expertise, Parker has been able to make a difference to our operation on many fronts. Time and again, Parker has demonstrated that its dedication to achieving joint total system performance is without compromise. That’s the kind of partner we want to go forward with.”



**Tony Scarazzo**  
 Director of Procurement  
 Lockheed Martin Aeronautics



## Revving up our engine work: Parker Aerospace on the F119

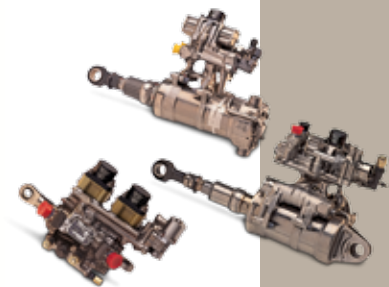
Parker Aerospace has long played a part in military aircraft engines. On the Pratt & Whitney F119 engine, Parker’s actuators are part of what makes the thrust vectoring capability of the F-22 Raptor’s powerplant such a standout. With titanium housings and titanium-matrix composite pistons, our light-weight, high-temperature-tolerant actuators established an industry milestone when they were certified for flight use. What’s more, they use fuel as the motive force, keeping system architecture simple and efficient. Our advanced-technology actuators are accompanied by Parker pumps, fuel nozzles, sensors, and fuel/hydraulic hose tube assemblies, helping to make the F119 engine a powerful part of why the F-22 owns the sky.



OBIGGS pressure and vent valves



F-22 air turbine starter and control valve



F119 asymmetric thrust servoactuation system



**LIFETIME SUPPORT**

Our cost-per-hour programs, dispatchability requirements, and fixed maintenance pricing actually guarantee performance.



F-35 hydraulic power module (integrated pump-motor package)



F-22 fuel tank inerting air separation module



Javelin control actuation system



Advanced boom nozzle

Aerazur Aerocet Aero-Fabricators AeroSpatiale Agusta Air Tractor  
AvCraft Aviation Aviat Aircraft Inc. Augusta Aviation, Inc. Baumann Floats  
Cirrus Design Corporation Claverham Limited Commander Premier Aircraft Company  
Diamond Aircraft Eclipse Aviation Embraer Eurocopter Extra Flugzeugbau FHL  
Hawker Beechcraft HDM Flugservice GmbH Honda Honeywell Hyundai  
Luscombe Aircraft Corporation Lycoming Maule Air, Inc. MD Helicopters  
Piper Aircraft Pacific Aerospace Limited Performance Aircraft Fuel Systems  
Precision Gear Inc. Quest Aircraft Rans Inc. Rolls-Royce Schweizer Aircraft  
Stoddard-Hamilton Aircraft, Inc. Symphony Taneja Aerospace & Aviation Limited  
United Valve Vans Aircraft Vulcanair Waco Classic Aircraft Corporation





## Systematizing advantage for business jet and general aviation customers

Inc. Alpha Aviation American Champion Aircraft AOA Apparatebau Gauting  
Bombardier Britten-Norman Camsc Inc. CASA Cessna Aircraft Company  
Constructions Aeroautiques de Bourgogne Daewoo Dassault Aviation  
General Electric Gippsland Aeronautics Goodrich Grob Aerospace Gulfstream  
Israel Aircraft Industries Kenmore Air Lancair Liberty Aerospace  
Microtecnica Mooney Airplane Company MTU Aero Engines New Flight Corporation  
Specialists Piaggio Aero Industries Pilatus Aircraft Ltd. Pratt & Whitney  
Sino Swearingen Slingby Aviation Smiths Industries Socata  
Teledyne Technologies Thrush Aircraft TOST GmbH Tusas Engine Industries, Inc.  
Warner Aircraft Weatherly Aircraft Williams International Wipaire, Inc.

# The market: **business jets and general aviation**



## **Adding value: lowering the CPL for the Eclipse 500**

When it comes to operational efficiency, high cost-per-landing (CPL) can be as wearing on aircraft owners as runways are on aircraft wheels and brakes. So when Eclipse Aviation asked Parker Aerospace to tackle the topic for the Eclipse 500 program, it set a significant challenge. Beginning with the initial specifications for the 500, the two companies worked together in close cooperation to maintain performance while dramatically reducing cost. The end result? The Eclipse 500 enjoys one of the lowest CPLs anywhere in the industry.

### **“Braking” out of the pack**

Parker is known for many things, including one of the most recognized brands in the business: Cleveland Wheels & Brakes. Found on over 80 percent of the current general aviation fleet, Cleveland Wheels & Brakes have supplied over 60 years of reliable landings through hundreds of FAA technical standard order qualifications on single- and twin-engine aircraft. The brand is synonymous with better braking, smoother landings, and welcome savings. How respected is the brand? With applications on corporate jets, turbo-props, rotorcraft, tilt rotors, and most light twin- and single-engine aircraft, the answer is “very.”



Honeywell TFE 731 lubrication pump



Global Express distribution check valve



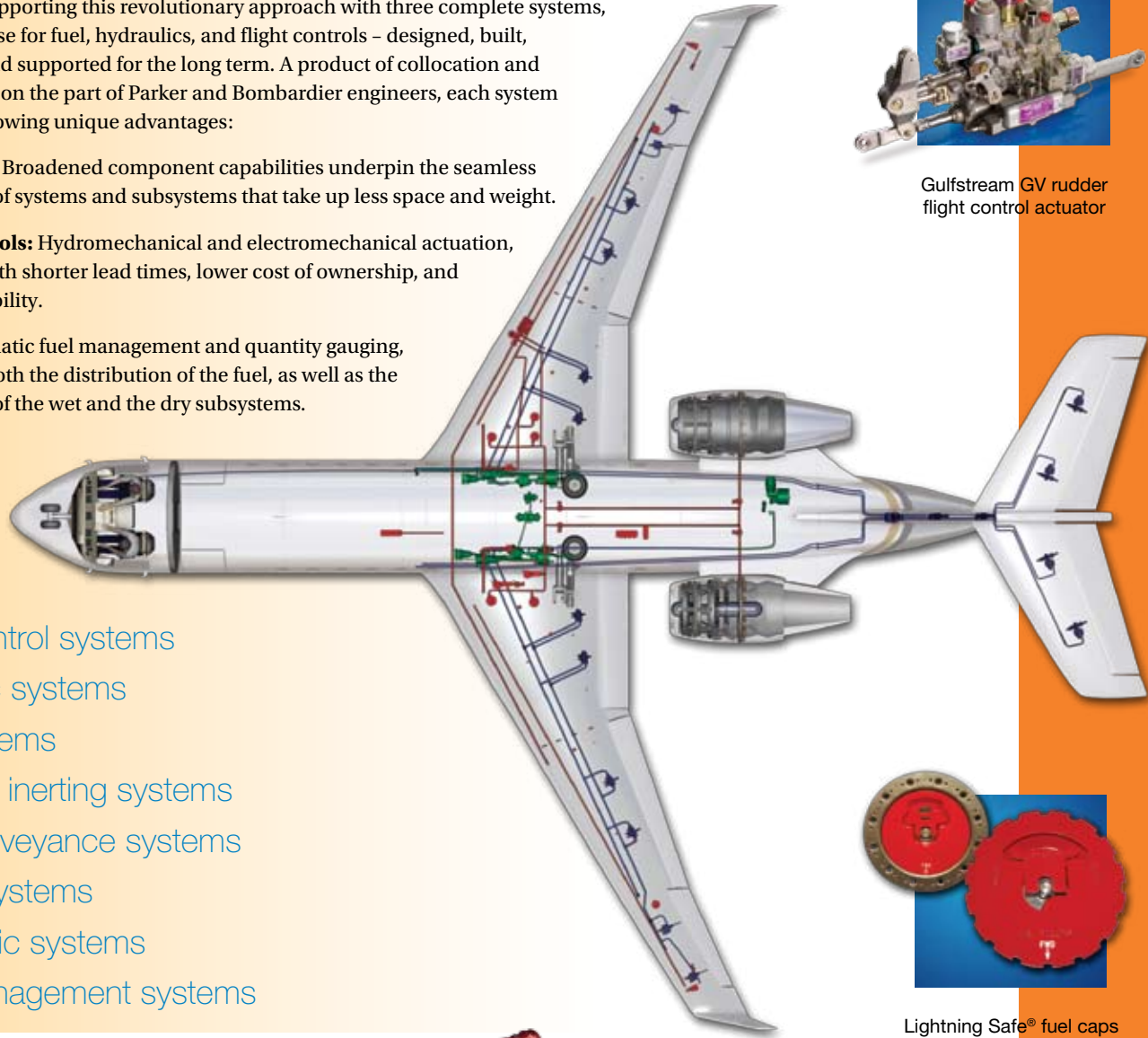
DC electric motor-driven pump package



## Where we're going in systems: years of experience

Where we're going in systems is due in large part to where we've been. Bombardier became an industry leader when it took a systems direction in the design of the Global Express business jet. Parker Aerospace was proud to be right along side, supporting this revolutionary approach with three complete systems, including those for fuel, hydraulics, and flight controls – designed, built, integrated, and supported for the long term. A product of collocation and collaboration on the part of Parker and Bombardier engineers, each system offers the following unique advantages:

- **Hydraulics:** Broadened component capabilities underpin the seamless integration of systems and subsystems that take up less space and weight.
- **Flight controls:** Hydromechanical and electromechanical actuation, delivered with shorter lead times, lower cost of ownership, and higher reliability.
- **Fuel:** Automatic fuel management and quantity gauging, balancing both the distribution of the fuel, as well as the integration of the wet and the dry subsystems.

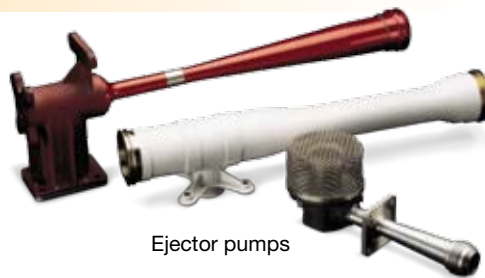


Gulfstream GV rudder flight control actuator

- Flight control systems
- Hydraulic systems
- Fuel systems
- Fuel tank inerting systems
- Fluid conveyance systems
- Engine systems
- Pneumatic systems
- Heat management systems



Lightning Safe® fuel caps



Ejector pumps

# The market: **business jets and general aviation**



## **Gaining ground: fueling the Mustang business jet**

Are simpler systems easier to expedite? In the case of the Mustang business jet, definitely. This new breed of small, yet fast, business aircraft is sporting a Parker-designed fuel quantity gauging system consisting of a minimal number of probes and a signal conditioner. The simplified and optimized system was aggressively pursued by Parker's multi-disciplinary team in order to meet Cessna's demanding development schedule. Close collaboration between the two companies was a necessity in meeting – and exceeding – expectations.



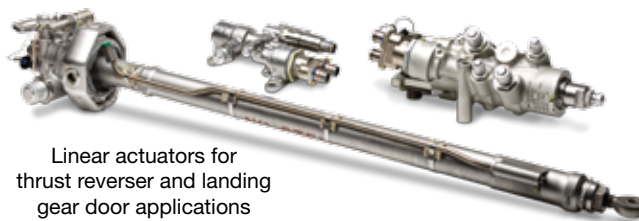
## **Partnering: reducing weight on the 7X**

What kind of partner rethinks a plane's entire system architecture in an effort to reduce weight? The right kind.

At least that was Dassault's view of things when we collaborated with its engineers on the hydraulic system for the 7X. Our combined efforts resulted in a hydraulic system that met all the necessary performance parameters, with a 40-percent weight reduction from the original design. A combination of simulation modeling and energy management studies helped us simplify our concept, driving us to create a more purely hydromechanical aircraft that used more engine-driven pumps. The Parker Aerospace experience base in existing hydromechanical technologies played a big part in the quick delivery of a redesigned, functional system.



The right rig – Working closely with Dassault engineers, Parker Aerospace simplified the hydraulic system on the 7X, resulting in a 40-percent weight reduction from the original concept. The hydraulic test rig (above) and its control panel (below) were critical to the process.



Linear actuators for thrust reverser and landing gear door applications

# How our customers see us

“ I have been working with Parker for the past eight years. Parker is a major partner on the 7X program, able to design and qualify the hydraulic system on its own, nevertheless with significant support from Dassault for aircraft integration. Parker has started working with the Dassault software tools for aircraft design and bill of material, allowing us to



**Bernard Dimoyat**  
Engineering  
Vice President  
Falcon 7X

work with a real partnership spirit. These tools helped Dassault to cut the typical assembly lead time by half!

Throughout the development of any

new aircraft program, there are always many technical changes, requiring communication. We have a very good relationship with Parker and, together, we have found solutions to our challenges.”



Embraer Legacy fuel quantity gauging system

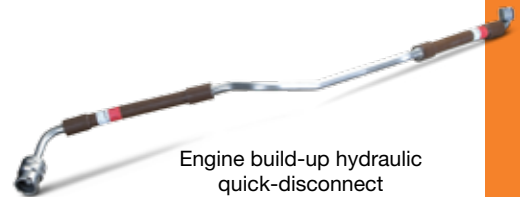


## Revving up our engine work: critical connections

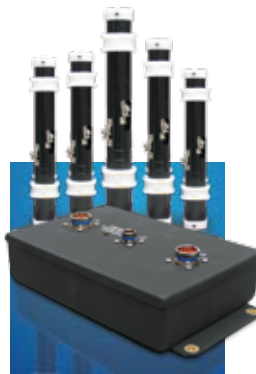
From fuel nozzles, actuators, and pneumatic products, to lubrication and scavenge pumps, Parker Aerospace is a power in powerplants. But we also offer a significant capability in total fluid distribution management for business jet and general aviation engines. Specifically, we supply the fuel, pneumatic, and hydraulic hoses, tubing, wiring harnesses, valves, and connectors that run from the engine to the pylon, and throughout the aircraft. These durable components combine to create leak-free systems of critical importance.



One-inch hydraulic ball valve with actuator



Engine build-up hydraulic quick-disconnect hose-tube assembly



Cessna Mustang fuel quantity gauging system



Cessna Citation X temperature control system



Parker's general aviation customers are supported by several levels of global customer support, ranging from a far-reaching network of distributors to geographically strategic service centers providing technical assistance 24/7.

Aerazul      Aeritalia      Aerocel      Aero-Fabricators      Aerospaziale      Agusta      Air  
 AOA      Apperatebau      Gauting      ATK      ATH      AvCraft Aviation      Aviat Aircraft  
 Bell Helicopter Textron      Boeing      Bombardier      Britten-Norman      Carmac Inc.  
 Commander Premier Aircraft Company      Constructions Aeroautiques de Bourgogne  
 EDO Corporation      Embraer      Eurocopter      Extra Flugzeugbau      FHL  
 Goodrich      Grob Aerospace      Gulfstream      Hamilton Sundstrand      Hanwha  
 Israel Aircraft Industries      Italian Ministry of Defence      Kaman Aerospace      Kenmore Air  
 Luscombe Aircraft Corporation      Lycoming      Maule Air, Inc.      MD Helicopters      Messier-Dowty  
 NATO      Piper Aircraft      Northrop Grumman      Orbital Sciences      Pacific Aerospace Limited  
 Poggio Aero Industries      Pilatus Aircraft Ltd.      Pratt & Whitney      Precision Gear Inc.  
 Sikorsky Aircraft      Sino-Swearingen      Slingsby Aviation      Smiths Industries      Snecma  
 Taroja Aerospace & Aviation Limited      Teledyne Technologies      Texas Instruments      Thomson-CSF  
 Vans Aircraft      Vought Aircraft Industries, Inc.      Vulcanair      Waco Classic Aircraft Corporation



## Taking technology in new directions

- Tractor, Inc.
- Airbus
- Alenia
- Alpha Aviation
- American Champion Aircraft
- Inc.
- AVIC I
- Augusta Aviation, Inc.
- BAE Systems
- Baumann Floats
- CASA
- Cessna Aircraft Company
- CFM
- Cirrus Design Corporation
- Claverham Limited
- Daewoo
- Dassault Aviation
- Diamond Aircraft
- EADS
- Eclipse Aviation
- France Ministry of Defence
- General Dynamics
- General Electric
- Gippsland Aeronautics
- Hawker Beechcraft
- HDM Flugservice GmbH
- Honda
- Honeywell
- Hyundai
- IAE
- Korean Aerospace Industries
- Lancair
- Liberty Aerospace
- Liebherr
- Lockheed Martin
- Microtecnica
- Mitsubishi Heavy Industries
- Mooney Airplane Company
- MTU Aero Engines
- Pacific Scientific Aerospace Group
- Performance Aircraft Fuel Systems Specialists
- Quest Aircraft
- Rans Inc.
- Raytheon Company
- Rolls-Royce
- SAAB
- Schweizer Aircraft
- Socata
- Stoddard-Hamilton Aircraft, Inc.
- Sukhoi
- Sumitomo
- Symphony
- Sextant
- Thrush Aircraft
- TOST GmbH
- Tussock Engine Industries, Inc.
- United Defense
- Warner Aircraft
- Weatherly Aircraft
- Williams
- Williams International
- Wipaire, Inc.

# The market: **tomorrow**



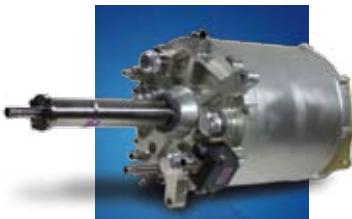
## **Adding value: determining priorities**

For many companies, research and development is an avenue that leads to spending money; at Parker Aerospace, it's just the opposite. We look at R&D as a direct path to value, making new approaches to cutting costs a top priority.

To achieve this end, we meet quarterly with key customers to determine their value priorities. It's an exercise that points us towards new technologies. By critically examining current technology, we are able to collaboratively create the needs list for the next generation of flight systems. These efforts result in focused deployment of our R&D efforts, providing leading-edge solutions at real-world costs.



Rotary electromechanical actuator



787 reservoir with automatic bleed valve



Electrohydrostatic actuation highly integrated pump-motor package

## **Partnering: taking the long view**

Ours is not a future we face alone. We work jointly with many customers in an effort to build long-term relationships and foster long-range thinking.

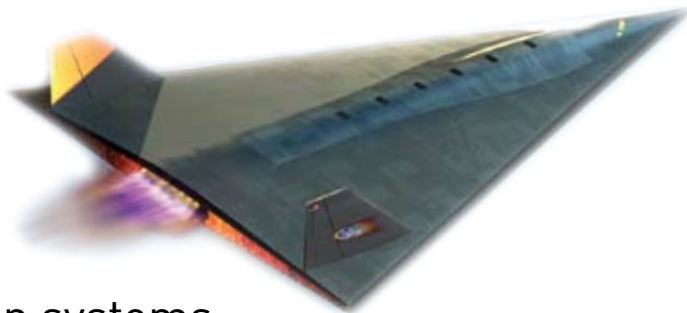
This collaboration is key in looking ahead. By aligning our technology road maps with those of our customers, we are able to dedicate our R&D resources in ways that effectively meet customer needs.

As the next generation of manned and unmanned aircraft come to light, Parker Aerospace looks forward to helping shape that vision.



**Forward focus** – At our SpiritWorks™ research and development lab, we are investigating alternate materials and processes for the next generation of flight.





## Where we're going in systems: **electronics cooling**

For Parker Aerospace, the future is looking very, very cool. That's because decades of leadership in fluid management for critical aerospace applications have been combined with our proprietary and revolutionary Macrospray® technology to create advanced cooling systems with significant advantages for aerospace electronics.

For example, our advanced cooling systems for the computer and power electronics market bring cooling to the board level, providing heat removal at up to ten times that of other cooling systems. Not only that, the easy-to-

maintain design of the Parker cooling system enables more computing throughput or power electronics in smaller packages.

Integrating a wealth of Parker technology - including smart pumps, electronic controllers, health monitoring, quick disconnects, seals, and our critical Macrospray technology - our innovative fluid cooling systems enable electronics designers to work with lower-flowing systems. This allows them to design in powerful electronics never before possible for both military and commercial applications.

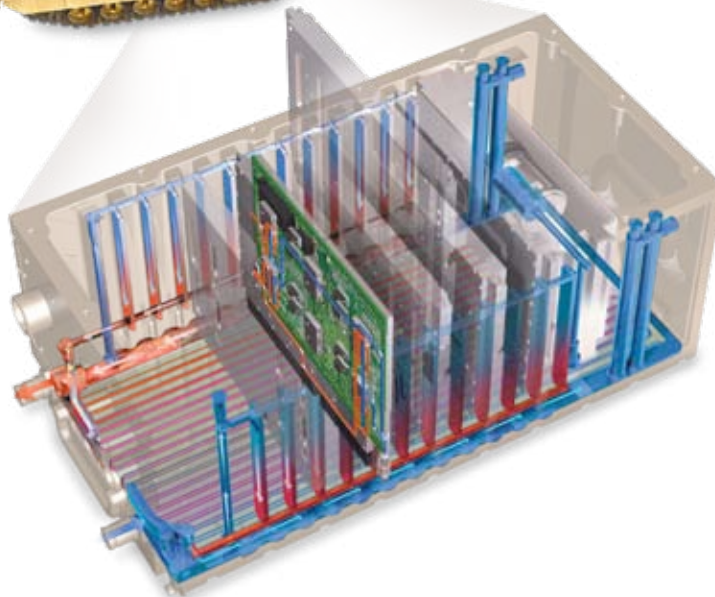
High-temperature electronics

Low-weight, high-heat materials

Advanced cooling systems

Engine systems

Fiber optics



Our advanced cooling systems bring fluid cooling to the chassis, board, and component levels, providing heat removal at up to ten times that of other cooling systems. An exciting new technology, it is now available for technology refresh and insertion.



Piezo electric actuated bleed valve



Dielectric isolator



Lightning isolator



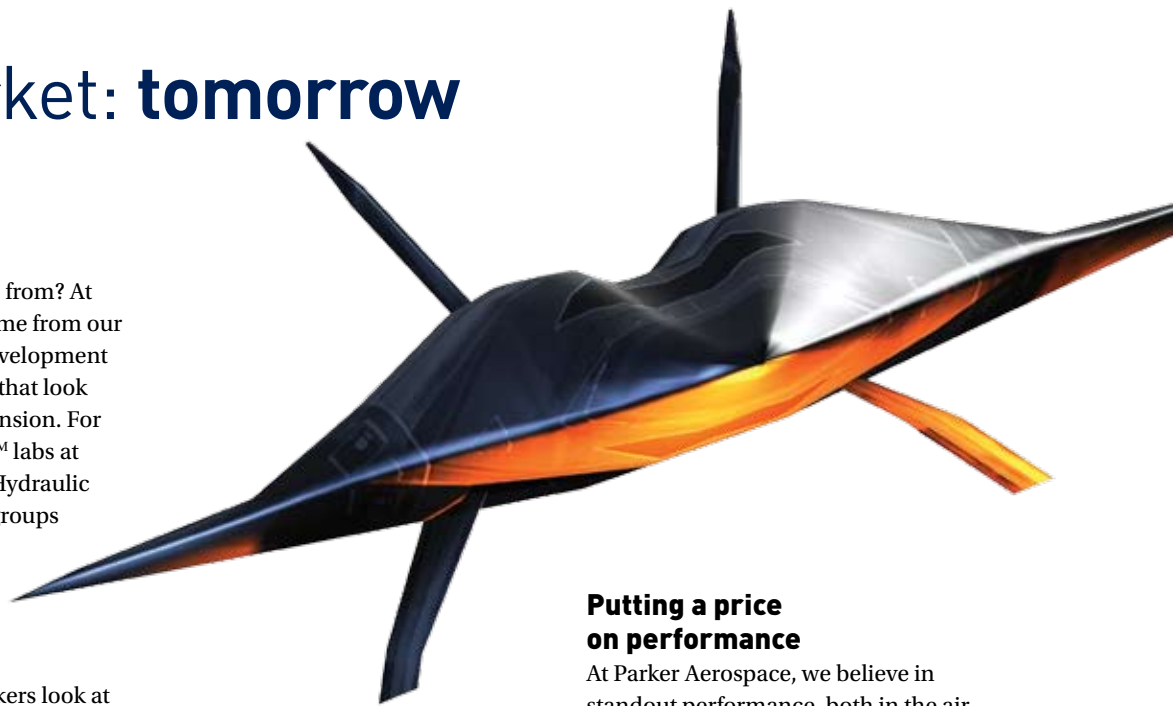
Integral starter generator

# The market: tomorrow

## Blue sky thinking

Where do new ideas come from? At Parker Aerospace, they come from our culture of research and development coupled with great minds that look at problems in every dimension. For instance, the SpiritWorks™ labs at our Control Systems and Hydraulic Systems Divisions house groups of innovative engineers charged with pushing the performance envelope.

These out-of-the-box thinkers look at flight control and actuation systems in different ways to create the motion control technology of tomorrow. They develop technology that not only innovates, but performs, providing reduced design cost, shortened time to market, and increased reliability. Like Parker's "Winovation" program, the collaborative idea-generator for the corporation, SpiritWorks is based on the principles of Stage-Gate®, a step-by-step business system that drives the commercialization of R&D efforts.



## Putting a price on performance

At Parker Aerospace, we believe in standout performance, both in the air and on the books.

Because of our adherence to lean practices, we can offer risk-sharing arrangements that guarantee operators forward pricing. These dollar-per-flight-hour programs are based on our intimate knowledge of our products' performance and reliability over time. By sharing the financial risk, we give operators the ability to budget fixed operating costs over the lifetime of aircraft ownership, creating peace of mind that's actually measurable.



**Fast-tracking the future** – The SpiritWorks research and development team at Parker's Control Systems Division looks at flight control and actuation systems in different ways to create the motion control technology of tomorrow.



A380 cabin video monitoring system

## Motor heads

That's how we affectionately refer to the Ph.D.s of Motor Design that populate the Parker Motor Design Center. Their brilliant minds are the mainstay of this Parker center of excellence that serves as a critical resource for the entire corporation. Functioning as a motor-design think tank, the Motor Design Center is focused on advancing the science of motor technology to the benefit of our customers. For example, the motors developed here are being used in smart pumps, which are replacing engine-driven fuel pumps in many new applications.

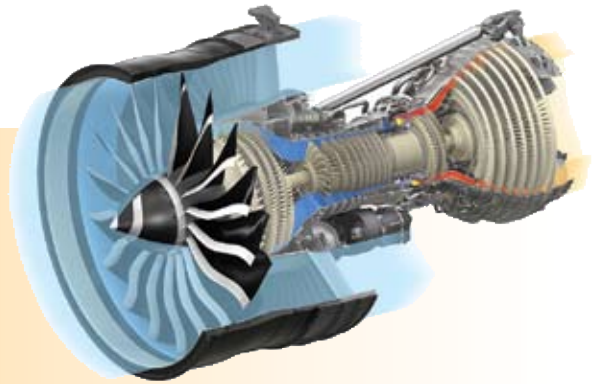
On the more immediate side, the Motor Design Center allows Parker Aerospace customers to leverage low costs, proven manufacturing capabilities, and rapid prototyping to produce a working motor in as little as 12 weeks. In the process, the latest analytical tools are used to design, prototype, and build the motors of tomorrow that will drive far-reaching change in the aerospace industry.

## Revving up our engine work: partnering on the GENx

Parker is helping to support change in the powerplant arena, too. We are partnering with General Electric on the GENx, a high-efficiency, ultra-quiet, ultra-performance engine selected to power the Boeing Dreamliner.

On the GENx, Parker Aerospace is providing the fuel spray nozzles for the engine's unique, twin-annular pre-swirl (TAPS) combustion system. The nozzles are an integral part of the engine's low-smoke, low-NOx, and low-CO performance. What's more, we are also providing the engine's flexible tube assemblies and quick disconnects for fuel and hydraulic applications.


**Going greener –**  
Our advanced fuel spray nozzles on the GENx contribute to the engine's innovative low-NOx performance.



Electromechanical primary flight control actuation system



An extensive performance database combines with our watchful eye to flag early or unusual problems in the field, which we then proactively address with our customers.



Air-Canada Air-China Air-France AirTran Airways Alitalia American Airlines  
Cathay-Pacific Chautauque Airlines China Airlines Continental Airlines Delta Air Lines  
Indian Airlines Italian Ministry of Defence Japan Airlines Japanese Defense Agency  
Kuwait Airways Lufthansa Malaysia New Zealand Ministry of Defence  
Singapore Airlines Skywest South African Airways South Korean  
UK Ministry of Defence United Airlines UPS U.S. Airways U.S. Air Force



**Upper-level support with bottom-line advantages for virtually everything that flies**

- Australian Department of Defence
- British Airways
- Canadian Department of National Defence
- Emirates
- EVA Air
- FedEx
- France Ministry of Defence
- India Ministry of Defence
- JetBlue Airways
- KLM
- Korean Airlines
- Korean Ministry of National Defense
- Northwest Airlines
- Qantas
- Royal Netherlands Ministry of Defence
- Royal Thai Air Force
- Ministry of National Defense
- Southwest Airlines
- Thai Airways
- TranStates
- U.S. Army
- U.S. Coast Guard
- U.S. Marines
- U.S. Navy
- Vietnam Airlines

# The market: customer support

Parker's worldwide support services are designed to be custom fit to your requirements, lowering your cost of ownership with innovative maintenance and pricing programs to meet your needs now, and for the life of your aircraft. Our worldwide services include:

- Spares, overhaul, and repair
- 24-hour AOG support
- Cost-per-hour programs
- Field service engineering
- Fixed maintenance pricing
- Training
- Technology insertions
- Extended warranties
- Exchange programs
- Advance-ship service
- Electronic repair status
- E-commerce

## Customized support agreements

When it comes to MRO, we continue to be at the forefront of customer support by improving the way we do business through innovation. Our forward thinking allows us to take a proactive approach to MRO systems integration, customized programs, flight hour agreements, and inventory logistics support. On-site technical service, 24-hour global support, cost-per-hour programs – the choice is yours. But the affordability and the reliability? That's all ours.

## Lifetime support, predictably priced

How do we address the military's need to control maintenance costs? By offering customizable service options that share the risk, as well as the reward, of lifetime support.

At Parker Aerospace, our cost-per-hour programs, dispatchability

requirements, and fixed maintenance pricing actually guarantee performance, in the air and on the books. We have provided our military customers with performance-based logistics contracts delivering new levels of service and accountability. Making it predictably cost effective to move fleets from status quo to status go.



## Local in more locales

Germany, Brazil, Singapore, China, Malaysia, New York, Massachusetts, Arizona, Michigan, Georgia, Ohio, and California – our many service locations around the world combine with our extensive network of AOG operators to provide you with the benefits of local service in more locales.



**Another Parker Aerospace first –**  
The first independent hydraulic service center capable of 5,000-psi service, ACE Services is a joint venture between SIA Engineering Company (SIAEC), a leading aviation MRO company, and Parker.



### **The right services, right where you need them**

Parker Aerospace has scored a service ace with Aerospace Component Engineering Services (ACE Services™), a 30,000-square-foot MRO facility located in Singapore.

Specializing in hydraulic pumps, flight control actuators, and thrust reverser actuators, ACE Services is the first independent hydraulic service center in the world capable of 5,000-psi service, which enables it to support Airbus A380s and Boeing 787s when in service in the region. In addition, ACE Services provides critical MRO services for hydromechanical equipment and is also the first in-region facility providing original-equipment MRO support of Parker systems and components. The bottom line? Faster hydraulics MRO, local support, and OEM-quality parts and service for all Asia Pacific carriers.



**On top of customer needs –** Partnership programs allow Parker Aerospace to have permanent depot residence for 24/7 on-site support to fulfill Army aviation needs. Sikorsky and Parker work side by side to reduce depot turnaround times, incorporate OEM lean standards, and reduce costs.

# The market: customer support

## Online support

PHconnect, Parker's secure and personalized e-business website, offers around-the-clock customized support, including:

- Spares pricing and lead time
- Open order status
- Inventory availability
- Requests for quotes
- Order placement
- Credit card payment
- Shipment status
- Invoice viewing
- Open invoice and aging information
- Printing duplicate invoices

PHconnect also serves as a vehicle for training schedules and registration, as well as an idea forum for operators.



**Customer-centric** – Our frontline technical support is helping customers like Air Canada streamline entry into service for new fleet aircraft.



## Training

To help keep customers flying long and strong, we're providing operators with frontline technical support. As the operator teams receive new aircraft, Parker Aerospace people are by their side, demonstrating how to support, service, and troubleshoot Parker systems and components. This new approach to system-level support and training is in addition to traditional MRO services, and includes on-site technical support sessions, regional training symposiums with multiple operators, and web-based training courses.

## Actively proactive

Parker's Customer Support Operations is highly proactive, taking the initiative to identify and prevent problems at an early stage.

Because the field service team is also responsible for trend analysis and on-site training, Parker Aerospace has put together a customer relationship program that's proving quite successful. Combined with our reliability/maintainability database that tracks equipment for unusual or recurring hardware problems, the Minimum Customer Communication program – or MCC – is a proactive problem prevention program. Parker people contact their systems engineering customers on a scheduled basis to measure customer satisfaction and identify issues before they become significant.

The resulting improved communications and better sharing of information is paving the way to greater satisfaction – on both sides of the desk.



Parker's proactive issue-prevention program uses our reliability/maintainability database and one-on-one customer communication to identify unusual issues and provide solutions before they become larger.



# How our customers see us

“ We want to thank you for your support on our AH-64 requirements. Your performance status updates have been stellar. Thanks for the great support.”



**Christopher McGovern**  
Director of Purchasing  
Derco Aerospace, Inc.

“ We cannot tell you enough how much we appreciate all of the great teamwork that went into your efforts to repair our product. We could not have turned the unit around so quickly if it were not for Parker’s support.”



**Cavin Hill**  
General Manager  
Texas Aerospace Services



## International military support

International military customers enlist our support as well, enjoying the same services as the U.S. military. Working with our dedicated international support operation, global military organizations can customize their support agreements to include all of Parker’s service offerings. In addition, special arrangements can be made to allow international customers to obtain the licenses necessary to repair Parker Aerospace components themselves.



**Customer first** – We continue to be at the forefront of customer support, providing new and innovative ways to do business with both national and international customers.

# Move ahead with Parker

Aircraft makers in every market – commercial, military, business jet, general aviation, and those on the forefront of aerospace technology – are turning to Parker Aerospace for the systems and support they need to move ahead.

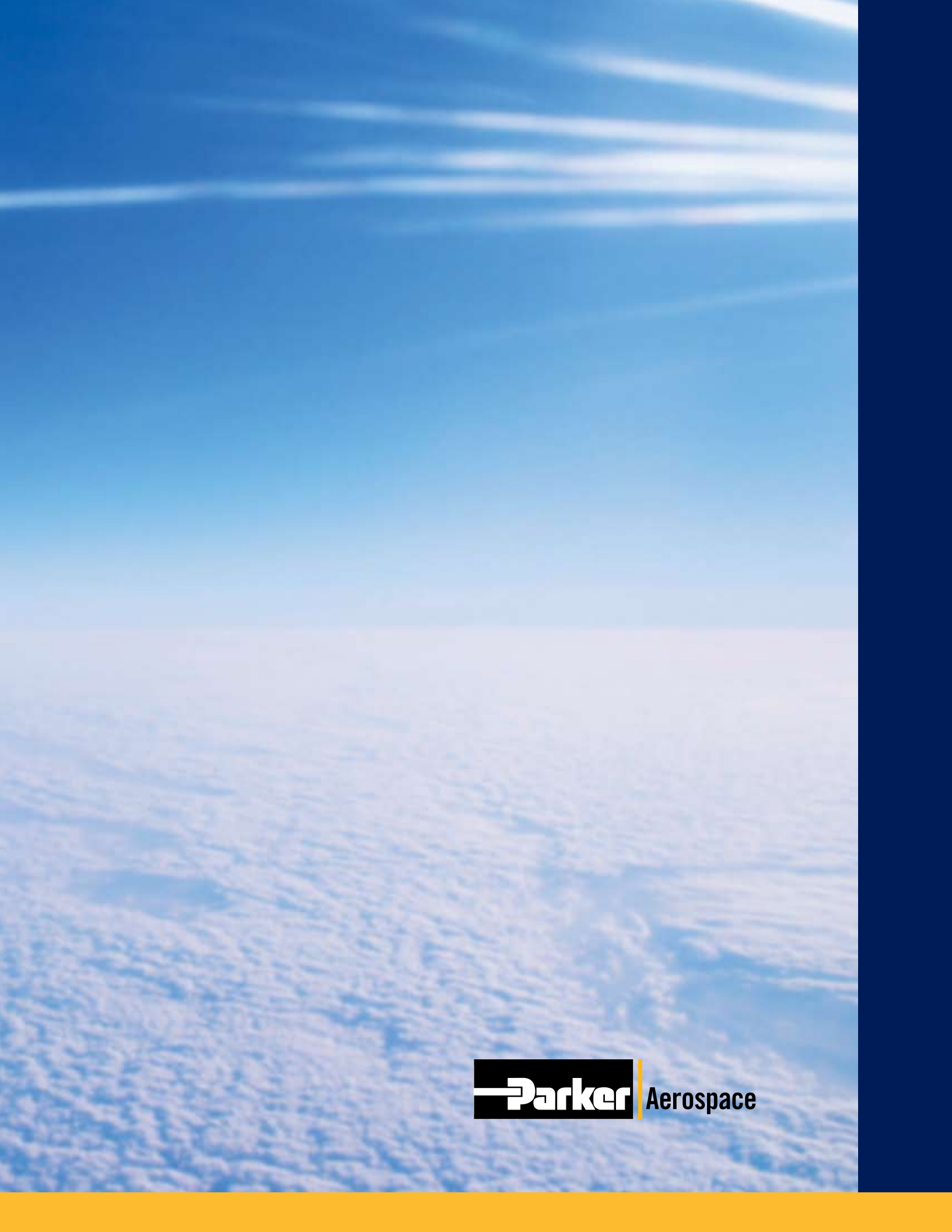
In addition to breakthrough technology, they're looking to us for shorter lead times, lower costs, higher reliability, shared risk, and lifetime support. All coupled with the anything-possible attitude and out-of-the-box thinking of a real partner.

Can we do it? As demonstrated on the previous pages, we already have.

Our commitment to providing the best value in leading-edge systems and subsystems has already taken us in exciting new directions, with the promise of more to come.

Value first and value fast. It's not only what the market demands, it's what Parker Aerospace is moving ahead to deliver.





**Parker** | Aerospace



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