Boeing F/A-18E/F Super Hornet & EA-18G Growler
The multi-mission F/A-18E/F “Super Hornet” is an evolutionary upgrade from the combat-proven night strike fighter F/A-18 C/D. It is nearly 25% larger than the C/D, yet more survivable with improvements like reduced radar and infrared cross sections made possible through design features and coatings, greater situational awareness, and an advanced countermeasure suite. Reduced vulnerability is achieved through an active dry-bay fire suppression system, self-sealing fuel tanks, explosion suppression foam in the wing fuel tanks, and hydraulic reservoir level sensing.

The aircraft was designed as a high performance multi-role fighter/attack aircraft with primary missions of fighter escort and interdiction; secondary missions of air defense, fighter escort, close air support, forward air control, and reconnaissance. Specifics may vary depending on mission scenario, but the F/A-18E/F range and endurance was increased significantly over that of the F/A-18 C/D across the war fighting spectrum.

The aircraft is powered by two General Electric augmented turbofan engines rated at 22,000 lb of thrust. A mid-span leading-edge sawtooth helps maintain aileron effectiveness and provides a high degree of maneuverability for the dogfighting role. Maximum speed exceeds Mach 1.7. The F-18 was the first US fighter capable of supersonic speeds without the use of afterburners.

The F/A-18E/F is replacing the F-14 Tomcat, the A-6 Intruder, the F/A-18 A/B, older F/A-18 C/D’s, and the EA-18G will replace the EA-6B, and will operate from the nation’s aircraft carriers.

Eaton is a recognized leader in the aerospace industry and is a key supplier of hydraulics, fuel, conveyance and actuation products. With this cutting edge technology, Eaton provides a broad array of products on the F/A-18 E/F.

The F/A-18E/F aircraft design incorporates two independent Type II Hydraulic Systems rated for “dual-pressure” 3000 psi (20,600 kPa) and 5000 psi (34,500 kPa). Each system is pressurized by a single variable delivery pump driven by the engines through an aircraft mounted accessory drive (AMAD). These pumps normally provide 3000 psi pressure compensation to their hydraulic circuits.

Eaton’s Vickers® product line pumps can be transitioned from 3000 psi to 5000 psi or from 5000 psi to 3000 psi via an electrical solenoid valve commanded by the flight control computer (FCC). This unique “dual-pressure” pump capability allows the flight control computer to match the pump horsepower to the aircraft’s control surface loading. The maximum flight control surface loads occur at high aircraft speeds.

Eaton also provides debris monitoring chip detectors and Prismalite® manual level gauges for the F414-GE-400 engine lube system.

An electro/optical sensor, Levelmaster® is mounted in the fuel tank vent tube to detect the presence of fuel during in-air refueling operation.

Eaton’s Aeroquip® product line supports the routing for the hydraulic system. They utilize a 5000 psi fire zone rated hose, with optimized thin wall silicone fire sleeve, 5000 psi self-sealing end fittings, and 5000 psi Rynlok™ Tube Fitting products, connecting tube assemblies, and wing fold and landing gear swivels. Eaton provides the main engine fuel line, the electronic cooling hose and coupling products, and high temperature air applications utilizing V-band couplings and flanges.

The diversity of Eaton’s shipset is representative of the company’s product range and capabilities. Each component has the common features of meeting or exceeding industry requirements for leakage, optimizing weight and pressure drop, while providing the performance required to support the superior performing fighter/attack aircraft.

Modern military fighters like the F/A-18E/F have sophisticated environmental control systems (ECS) which support cabin air quality and pilot survivability. Because such aircraft operate in severe physical environments that are not survivable by unprotected pilots under ordinary conditions, these complex aircraft contain highly reliable and complex ECS systems which utilize Eaton’s static seals, flanges and couplings at the joints of the ducting system. These components are designed to manage the conveyance of high pressure, high temperature air under the most challenging g forces.

Eaton also provides Centurion™ mechanical seals for the F414-GE-400 engine gearbox.

Eaton’s shutoff valves, fuel flow sensors, precheck valves and external fuel tank pressurization and vent valves are utilized in the FA/18 E/F fuel system.
Boeing F/A-18E/F “Super Hornet” Strike Fighter Components/Systems

Engine Solutions
1. Time Delay Restrictor Valve
2. Solenoid Operated Selector Valve
3. Manually Override Check Valve
4. Chip Detectors
5. Static Seals
6. Engine Gearbox Carbon Seals
7. ECS Couplings
8. ECS Heat & Defrost Control
9. Rectangular V-Band Coupling
10. Flanges
11. Hose Assemblies

Hydraulic Systems
19. Engine-Driven Pumps
20. Emergency Landing Gear Control
21. Emergency & Parking Brake Control
22. Gun Drive System
23. Dual Brake Valve
24. Hose Assemblies
25. 3900 Series Couplings
26. 145/155 Series Couplings
27. Rynglok® Tube Fittings
28. Wing Pylon Actuator

Fuel Systems
12. In-Flight Refueling Nozzle
13. Fuel Presence Sensor
14. Flow Regulator
15. Flexible Fuel Duct
16. Level Indicators, Fuel Flow Sensors
17. Float Switch
18. Switching Valve, Precheck Valve, Shutoff Valves

Hydraulic Systems
19. Engine-Driven Pumps
20. Emergency Landing Gear Control
21. Emergency & Parking Brake Control
22. Gun Drive System
23. Dual Brake Valve
24. Hose Assemblies
25. 3900 Series Couplings
26. 145/155 Series Couplings
27. Rynglok® Tube Fittings
28. Wing Pylon Actuator

Motion Control
29. Ram/Bleed Air Door Actuator
30. Landing Gear Swivel
31. Missile Ejector Lock Actuator
32. Control Stick Feel/Trim Actuator
33. Ram Air Scoop Actuator
34. Control Stick Ratio Actuator
35. Wing Fold Control System
36. Canopy Drive
37. Lateral Position Sensor Assembly
38. Feel/Trim Sensor Assembly

Other
39. Forward Cockpit Louvers
40. Aft Cockpit Louvers
Gun Drive System
P/N 570221
Eaton’s gun drive system simultaneously rotates the barrels for firing and feeds ammunition to the gun through a linkless feed system especially designed for cycling at the Vulcan’s high firing rate. The gun drive motor package powers the gun at 3000 psi (20,600 kPa) externally, operating independently of gun chamber pressure to provide continuous, positive rotation that is uninterrupted by misfires.

Switching Valve
P/N MC19710
Eaton’s switching valve provides autonomous switching of critical functions from one system to the other in the event of a failure in the primary hydraulic system. Eaton’s switching valve technology also provides pre-flight and continuous in-flight subsystem leak integrity testing. In-flight testing assures that a secondary hydraulic system is not switched into a leaking subsystem, preventing a second system failure. The switching valve is capable of operation at either 3000 psi (20,600 kPa) or 5000 psi (34,500 kPa) system pressure.

Flow Regulator
P/N MC12656
Eaton’s flow regulator provides a solenoid selected dual speed control of the gun drive system and maintains a constant flow under varying hydraulic motor load conditions. The regulator operates at 3000 psi (20,600 kPa) system pressure. The two regulated flows provides two different fire rate of the gun and is pilot selected by energizing a 28 VDC solenoid.

Dual Brake Valves
P/N MC12362-5 and MC12364-3
Eaton’s dual brake valves provide independent and proportional brake control to the right and left main landing gear brakes under normal and emergency conditions. The dual brake valves are a hydraulic servo design that provides a hydraulic pressure output proportional to the pilot’s mechanical input force. The brake valve provides normal brake pressure, emergency brake pressure and parking brake pressure using 3000 psi (20,600 kPa) system pressure.
In-Flight Refuel Control Valve
P/N MC14432-2

Eaton’s in-flight refuel control valve is a 3-position, 4-way design that is operated by a pair of 28 VDC solenoid valves. The solenoid valves shift the main spool and sleeve valve to either extend or retract the IFR Probe. The probe position is dependent on which solenoid is energized. The manifold has a separate pilot operated emergency spool and sleeve valve that allows the probe to extend regardless of the position of the main spool and sleeve.

Time Delay Restrictor Valve
P/N MC19098-1 and MC19099-1

Eaton’s time delay valves are used in the landing gear. They provide a sequencing function between the doors and the gear. These valves provide a 0.1 second delay before switching from the restricted to free flow.

Manual Override Check Valve
P/N 53270-1

Eaton’s manual override check valve is used in the hydraulic system. The valve can be manually opened using a 90° rotary input command.

Rynglok Tube Fittings
P/Ns (contact rep for complete listing)

The primary tube fittings for the F/A-18E/F Strike Fighter are the 5000 psi (34,500 kPa) OEM-style, titanium Rynglok Tube fittings. On low pressure fluid delivery tubing, such as fuel and coolant lines, the Super Hornet also uses the lightweight, aluminum version Rynglok fittings. These axial swage fittings provide a permanent, reliable link to join fluid delivery tubing while minimizing system weight. Fittings include permanent and ArcSeal® separable connections in straight, elbow, and tee configurations.

Louvers
P/Ns (contact rep for complete listing)

Eaton manufactures more than a dozen different louver assemblies for the F/A-18 E/F aircraft. They are arranged in all possible vacant cavities of the cockpit to provide heat and air conditioning to the front and back seat.

Flexible Fuel Duct

The F/A-18E/F fuel inlet duct is a 2 inch diameter aluminum tube assembly that allows for three degrees of movement. It employs a pressure balance slip tube to prevent end loads due to fluid system pressure. This movement allows for engine removal, thermal growth, in-flight flexure, installation tolerances, and engine displacement should an engine mount fail. The duct is rated for all fuel system pressures and temperature ranges of -65°F to 265°F (-53°C to 129°C). It connects to the mating airframe flapper value connector.

Rectangular V-Band Coupling
P/Ns NH1009052-10, NH1009052-20, ST7M464-1

Eaton’s sheet metal V-band couplings and flanges connect and seal all types of tubing, piping, ducts and containers. They meet functional requirements with optimized weight designs. The sheet metal V-band supplied on the F/A-18E/F, shown as the rectangular clamp, demonstrates the design flexibility of this product while meeting stringent performance requirements for the application.
Eaton’s float switch is a remote indicator of oil level in the AMAD.

**Float Switch**
P/N A4473

Eaton’s float switch provides remote indication of low oil levels in the F/A-18’s Auxiliary Power Unit (APU).

Eaton’s sampling valve facilitates the remote leak-free extracting of oil samples for off-site analysis.

**Sampling Valve**
P/N A4283, A4350

145/155 Series Ground Service Quick Disconnect Couplings
P/N AE82134R

Eaton’s Aeroquip 145/155 series couplings have been the industry standard for hydraulic ground service applications for over 50 years. The F/A-18E/F utilizes the most current design improvements, which include soft seal for leak free connection as well as disconnection and blunt start threads to prevent cross threading during connection.

3900 Series Couplings
P/Ns AE89799K, AE89800K

The F/A-18E/F radar cooling system incorporates Eaton’s 3900 series coupling, which is a one-hand operation self-sealing quick-disconnect coupling used extensively where low pressure drops are required. The 3900 series coupling eliminates spillage, leakage, or spraying during connection by employing a unique mechanical pull-home valving that makes it one, if not the best, coupling on the market.

Eaton’s sampling valve facilitates the remote leak-free extracting of oil samples for off-site analysis.

**Sampling Valve**
P/N A4283, A4350

Chip Detector
P/Ns A4300, A4757, 1B6681

Eaton’s chip detector is a sensor that detects ferrous wear particles in the F/A-18 engine lube oil system.

Sight Gauge
P/N S247-3

Eaton’s sight gauge provides a visual indication of oil level in the F/A-18’s APU.

Full-Flow Screen Housing
P/N 1D6751

Eaton’s ull-flow screen housing is a self-closing valve and screen that allows the chip detector to monitor the complete oil flow.

Eaton’s float switch is a remote indicator of oil level in the AMAD.

**Float Switch**
P/N A4473, *2E231

Sampling Valve
P/N A4283, A4350

145/155 Series Ground Service Quick Disconnect Couplings
P/N AE82134R

Eaton’s Aeroquip 145/155 series couplings have been the industry standard for hydraulic ground service applications for over 50 years. The F/A-18E/F utilizes the most current design improvements, which include soft seal for leak free connection as well as disconnection and blunt start threads to prevent cross threading during connection.

3900 Series Couplings
P/Ns AE89799K, AE89800K

The F/A-18E/F radar cooling system incorporates Eaton’s 3900 series coupling, which is a one-hand operation self-sealing quick-disconnect coupling used extensively where low pressure drops are required. The 3900 series coupling eliminates spillage, leakage, or spraying during connection by employing a unique mechanical pull-home valving that makes it one, if not the best, coupling on the market.

Eaton’s sampling valve facilitates the remote leak-free extracting of oil samples for off-site analysis.

**Sampling Valve**
P/N A4283, A4350

Chip Detector
P/Ns A4300, A4757, 1B6681

Eaton’s chip detector is a sensor that detects ferrous wear particles in the F/A-18 engine lube oil system.

Sight Gauge
P/N S247-3

Eaton’s sight gauge provides a visual indication of oil level in the F/A-18’s APU.

Full-Flow Screen Housing
P/N 1D6751

Eaton’s ull-flow screen housing is a self-closing valve and screen that allows the chip detector to monitor the complete oil flow.

Eaton’s float switch is a remote indicator of oil level in the AMAD.

**Float Switch**
P/N A4473, *2E231

Sampling Valve
P/N A4283, A4350
Eaton’s electro/optical level sensor detects the presence of fuel in the aircraft’s tank vent tube to avoid overfill.

The Eaton family of product line names reflects a proud heritage of quality and innovation that has grown over the years through acquisition of a number of highly respected aerospace companies. Eaton still uses many of those companies’ names today, a reflection of their proud legacy of quality and customer satisfaction.

<table>
<thead>
<tr>
<th>Product Line or Series/Product Name</th>
<th>Product Descriptions</th>
<th>Cage Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AeroCheck®</td>
<td>Hydraulic Check Valves</td>
<td>9W928</td>
</tr>
<tr>
<td>Aerquip®</td>
<td>Hose Fittings, V-Band Couplings</td>
<td>00624</td>
</tr>
<tr>
<td></td>
<td>Ducting, Hoses</td>
<td>U3068</td>
</tr>
<tr>
<td></td>
<td>Fuel Ducts, Flex Joints, Swivel Joints</td>
<td>149C4</td>
</tr>
<tr>
<td>Tynglok®</td>
<td>Tube Fitting Systems</td>
<td>C2178</td>
</tr>
<tr>
<td>ArcSeal™</td>
<td>Dynamic Beam Separable Fittings</td>
<td>00624</td>
</tr>
<tr>
<td>Argo-tech™</td>
<td>Engine Fuel Pumps</td>
<td>58875</td>
</tr>
<tr>
<td></td>
<td>Repair Station</td>
<td>OCMF7</td>
</tr>
<tr>
<td>C-Seal™</td>
<td>Static Seals</td>
<td>15284</td>
</tr>
<tr>
<td>Carter®</td>
<td>Aircraft Ground Fueling Equipment</td>
<td>00723</td>
</tr>
<tr>
<td>Centurion™</td>
<td>Mechanical Seals and Sealing Components</td>
<td>77842</td>
</tr>
<tr>
<td>Eaton</td>
<td>Actuators, Bellows, Seals</td>
<td>F0562</td>
</tr>
<tr>
<td></td>
<td>Fuel Systems, Pumps, Valves</td>
<td>K2523, U1918, U9084</td>
</tr>
<tr>
<td></td>
<td>Pressure Switches, Transducers</td>
<td>02750</td>
</tr>
<tr>
<td></td>
<td>Rotary/Linear Actuators</td>
<td>17472, 99145, 09790, 72121</td>
</tr>
<tr>
<td></td>
<td>Pneumatic Ducting, Rigid and Flexible Pneumatic Joints</td>
<td>15284</td>
</tr>
<tr>
<td>Flex-Form™</td>
<td>Brush Seals</td>
<td>77842</td>
</tr>
<tr>
<td>Flex-Ring™</td>
<td>Brush Seals</td>
<td>77842</td>
</tr>
<tr>
<td>Microplex™, E-Seal™</td>
<td>Semi-Static Seals</td>
<td>15284</td>
</tr>
<tr>
<td>QDM®</td>
<td>Quantitative Debris Monitoring System</td>
<td>97484</td>
</tr>
<tr>
<td>Radial C-Seal™, U-Flx™</td>
<td>Semi-Static Seals</td>
<td>15284</td>
</tr>
<tr>
<td>Tynglok®</td>
<td>Tube Fitting Systems</td>
<td>00624</td>
</tr>
<tr>
<td>Steren®</td>
<td>Hydraulic Motors, Actuators, Control Valves</td>
<td>99643, 76050, 09790, 52906</td>
</tr>
<tr>
<td>Sure-Mate™</td>
<td>Quick Disconnect Couplings</td>
<td>00624</td>
</tr>
<tr>
<td>Tedeco®</td>
<td>Chip Collectors</td>
<td>97484</td>
</tr>
<tr>
<td>Twist-Flx™</td>
<td>Semi-Static Radial Type Seals</td>
<td>15284</td>
</tr>
<tr>
<td>Ultra-Mate™, U-Flx™</td>
<td>Self-Sealing, Self-Locking Fluid Couplings</td>
<td>00624</td>
</tr>
<tr>
<td>Vickers®</td>
<td>Hydraulic Pumps, Electric Motorpumps, Hydraulic Motors, Power Transfer Units</td>
<td>62983, 90166, K4413</td>
</tr>
<tr>
<td>Zapper®</td>
<td>Debris Monitor</td>
<td>97484</td>
</tr>
</tbody>
</table>