



F-16

SUSTAINMENT SERVICES



Courtesy - U.S. Air Force photo SMSgt Thomas Meneguini

Moog Inc. is a worldwide designer, manufacturer, and integrator of precision motion control products and systems. Over the past 60 years, we have developed a reputation for delivering innovative solutions for the most challenging motion control applications. As a result, we have become a key supplier to the world's leading aircraft manufacturers and are positioned on virtually every platform in the marketplace – supplying reliable actuation systems that are highly supportable and add significant value for our customers.

A key element of our success has been our customer focus. With Moog, you will find a team of people ready to deliver quality products and support services, all while being flexible and responsive to your needs. Our superior products and services directly reflect the creativity, work ethic and remarkable attention to purpose of our people. We exhibit our commitment by supporting our products throughout the life cycle of a platform, from idea conception and design of original parts, to aftermarket support and service.

With Moog, you will find a wide spectrum of products, services and support from a dedicated and trustworthy organization. Our culture, coupled with our commitment to our customers, process control and product innovation, will continue to drive the success of our company and yours.

SUPPORTING MISSION NEEDS

Moog is the world leader in the design and manufacturing of complex flight control equipment. Moog provides actuation systems to the world's most advanced aircraft, including the F-16 Leading Edge Flap Drive System (LEFDS). We maintain our leadership position in the repair, overhaul and modification of the F-16 LEFDS hardware by providing the highest quality product support available.

From the introduction of the YF-16 and F-16XL, to the F-16 Block 60, Moog's hardware typifies the state-of-the-art in rotary mechanical actuation systems. Our current F-16 Block 40/50/60 system has been tested to 16,000 hours of equivalent flight time and represents the most advanced technology in design, materials and manufacturing.

LEADING EDGE FLAP DRIVE SYSTEM (LEFDS) – TECHNICAL DESCRIPTION

The function of the F-16 Leading Edge Flap Drive System is to provide the power required to extend and retract the leading edge flaps and to accurately position these flaps as commanded by the aircraft's flight control computer. The power required to drive the flaps is provided by two hydraulic motors located on the power drive unit (PDU). The PDU is an assembly of the hydromechanical actuator, electromechanical control actuator, hydraulic control valve, and various tubes and linkages. The PDU transmits torque along the hinge line, via the angle gearbox, to the mechanical rotary actuators by means of a series of torque shafts. The mechanical rotary actuators function as hinges, as well as gearboxes, and serve to convert the low level output torque from the PDU to the high level of torque required to drive the flaps.

To provide a method of controlling either flap, in the event a torque shaft should fail, the system incorporates two asymmetry brakes located on the outermost part of each wing tip. The brakes have the capability of detecting excessive asymmetry between the two flaps and also any excessive rate of travel of either flap. Should either of these conditions exceed the acceptable limits during flight, the brakes will arrest the torque tubes, thus locking both flaps in position, allowing continued safe flight of the aircraft.



THE F-16 LEADING
EDGE FLAP DRIVE
SYSTEM

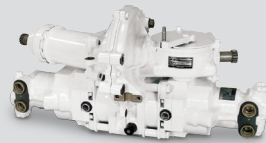


1



Power Drive Units (PDUs)

2



Hydromechanical Actuators (HMAs)

3



Control Actuators

4



Angle Gearboxes



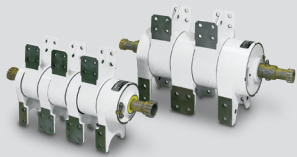
Courtesy - U.S. Air Force photo/Staff Sgt. Christopher Boitz

5



Torque Shafts

6



Rotary Actuators

7



Asymmetry Brakes

HARDWARE FOR THE F-16 LEADING EDGE FLAP DRIVE SYSTEM

NOMENCLATURE	QTY PER S/S
Power Drive Unit (PDU)	1
Actuator, Hydro-Mechanical (HMA)	1
Hydraulic Motor	2
Control Valve, Hydraulic	1
Rotary Actuator, Mechanical, Station #1	2
Rotary Actuator, Mechanical, Station #2	2
Rotary Actuator, Mechanical, Station #3/4	4
Angle Gearbox, Bevel	2
Asymmetry Brake	2
Control Actuator, Electro-Mechanical	1
Torque Bar, Fusible	2
Torque Shaft, Telescoping	2
Torque Shaft	1
Torque Shaft	1
Torque Shaft	2
Torque Shaft	2
Torque Shaft	2
Torque Shaft	3
Boot, Seal, Rubber	20

A/B AIRCRAFT (BLOCK 01/05/10/15)			
PART NUMBER	CONFIGURATION STATUS	DESIGN YR	NATIONAL STOCK #
16M002-3*	Original Release	1974	1650-01-041-0477
16M002-5*	HMA Improvement	1981	1650-01-041-4875
16M002-811	Control Valve Improvement	1987	1650-01-322-6311
16M002-819	Control Valve Improvement	1990	1650-01-368-8214
2022070-1-1*	Original Release	1974	1650-01-041-0478
2022070-2-1	Improved Attachment Bolt	1981	1650-01-143-0394
4100020-1	Original Release	1974	1650-01-104-6188
58500-2 *	Original Release	1974	1650-01-043-4619
58500-3	Improved Solenoid	1987	4810-01-279-7141
58500-6	Preferred Replacement	1990	1650-01-324-3564
2022056-1-1*	Original Release	1974	1680-01-048-8977
2048342-2-1	Preferred Replacement	1987	1680-01-276-8711
2740496-3-1**	Optional Replacement	1989	1680-01-324-8152
2022056-1-1*	Original Release	1974	1680-01-048-8977
2048342-2-1	Preferred Replacement	1987	1680-01-276-8711
2740496-3-1**	Optional Replacement	1989	1680-01-324-8152
2022058-1-1*	Original Release	1974	1680-01-042-3261
2022058-1-2*	Improved Flange	1984	1680-01-225-7319
2048344-1-4	Preferred Replacement	1986	1680-01-230-1279
2740498-2-1**	Optional Replacement	1989	1680-01-324-8151
2022052-1-1*	Original Release	1974	1680-01-045-1018
2740606-1-1	Preferred Replacement	1993	1680-01-355-0721
2022072-1-1*	Original Release	1974	1560-01-041-0479
2022072-2-1*	Improved Design	1980	1680-01-126-0296
2022072-3-1*	Heat Treat Modification	1981	1680-01-126-0296
2022072-4-1	Preferred Replacement	1983	1680-01-168-9396
2022032-1-1	Original Release	1974	1650-01-045-1019
2022074-1	Original Release	1974	1560-01-043-3793
2022074-2	Preferred Replacement	1982	3040-01-123-7277
2022078-1-1*	Original Release	1974	3040-01-043-3794
2022978-1-2	Preferred Replacement	1996	3040-01-150-2423
2022064-1-1*	Original Release	1974	3040-01-143-3796
2022976-1-2	Preferred Replacement	1996	3040-01-149-7444
2022064-2-1*	Original Release	1974	3040-01-043-3797
2022976-2-2	Preferred Replacement	1996	3040-01-160-1131
2022064-3-1*	Original Release	1974	3040-01-043-3798
2022976-3-2	Preferred Replacement	1996	3040-01-149-7445
2022064-4-1*	Original Release	1974	3040-01--044-0431
2022976-4-2	Preferred Replacement	1996	3040-01-148-7912
2022064-5-1*	Original Release	1974	3040-01-043-3792
2022976-5-2	Preferred Replacement	1996	3040-01-151-2256
2041812-1	Original Release	1981	5975-01-175-2032

Notes: * Hardware is obsolete and no longer in production. The listed replacement hardware is qualified and approved for use on the F-16 LEFDS.

** Requires extensive modification of the wing and flap prior to installation.

C/D AIRCRAFT (BLOCK 25/30/32)			
PART NUMBER	CONFIGURATION STATUS	DESIGN YR	NATIONAL STOCK #
16M002-801*	Original Release	1985	1650-01-159-0277
16M002-807	Control Valve Improvement	1987	1650-01-283-4054
16M002-817	Control Valve Improvement	1990	1650-01-564-1844
2022070-3-1	Longer Lever Arm	1983	1650-01-149-4738
4100020-1	A/B Aircraft Design	1974	1650-01-104-6188
58500-2 *	A/B Aircraft Design	1974	1650-01-043-4619
58500-3	Improved Solenoid	1987	4810-01-279-7141
58500-6	Preferred Replacement	1990	1650-01-324-3564
2048342-1-4*	Increased Fatigue Life	1986	1680-01-230-1280
2048342-2-1	Increased Shaft Clearance	1987	1680-01-276-8711
2740496-3-1**	Optional Replacement	1989	1680-01-324-8152
2048342-1-4*	Increased Fatigue Life	1986	1680-01-230-1280
2048342-2-1	Increased Shaft Clearance	1987	1680-01-276-8711
2740496-3-1**	Optional Replacement	1989	1680-01-324-8152
2048344-1-4	Increased Fatigue Life	1986	1680-01-230-1279
2740498-2-1**	Optional Replacement	1989	1680-01-324-8151
2022052-1-1*	A/B Aircraft Design	1975	1680-01-045-1018
2740606-1-1	Preferred Replacement	1993	1680-01-355-0721
2022072-4-1	Improved Ball Ramp	1983	1680-01-168-9396
2022032-2-1	Longer Lever Arm	1983	1650-01-150-8939
2022074-2	Increased Load Capacity	1982	3040-01-123-7277
2022978-1-1*	Added Grease Barriers	1983	
2022978-1-2	Preferred Replacement	1996	3040-01-150-2423
2022976-1-1*	Added Grease Barriers	1983	
2022976-1-2	Improved Corrosion Protection	1996	3040-01-149-7444
2022976-2-1*	Added Grease Barriers	1983	3040-01-160-1131
2022976-2-2	Preferred Replacement	1996	
2022976-3-1*	Added Grease Barriers	1983	
2022976-3-2	Preferred Replacement	1996	3040-01-149-7445
2022976-4-1*	Added Grease Barriers	1983	
2022976-4-2	Improved Corrosion Protection	1996	3040-01-148-7912
2022976-5-1*	Added Grease Barriers	1983	
2022976-5-2	Preferred Replacement	1996	3040-01-151-2256
2041812-1	A/B Aircraft Design	1981	5975-01-175-2032

C/D/E/F AIRCRAFT (BLOCK 20/40/42/50/52/52G/60)			
PART NUMBER	CONFIGURATION STATUS	DESIGN YR	NATIONAL STOCK #
16M002-813*	Original Release	1987	1650-01-279-1087
16M002-815 / C36909-001	HMA Improvement	1989	1650-01-306-1268
16M002-821 / C36909-002	Control Valve Improvement	1990	1650-01-340-6328
16M002-823	Rerouted Tube For Clearance	2002	
2048666-1-1*	Original Release	1987	1650-01-261-8078
2048666-2-1	Increased Fatigue Life	1989	1650-01-308-0839
4111016-1	Original Release	1987	1650-01-302-3404
58500-3	C/D Aircraft Design	1987	4810-01-279-7141
58500-6	Increased Fatigue Life	1990	1650-01-324-3564
2740012-2-1	Original Release	1989	1680-01-450-6899
2740014-2-1	Original Release	1989	1680-01-450-6900
2740016-2-1	Original Release	1989	1680-01-450-6898
2022052-2-1*	Improved Bearing Design	1988	1680-01-315-8298
2740606-1-1	Increased Fatigue Life	1990	1680-01-355-0721
2022072-4-1	C/D Aircraft Design	1983	1680-01-168-9396
2022032-2-1	C/D Aircraft Design	1983	1650-01-150-8939
2022074-2	C/D Aircraft Design	1982	3040-01-123-7277
2022978-1-1*	C/D Aircraft Design	1983	
2022978-1-2	Improved Corrosion Protection	1996	3040-01-150-2423
2022976-2-1*	C/D Aircraft Design	1983	
2022976-2-2	Improved Corrosion Protection	1996	3040-01-160-1131
2022976-3-1*	C/D Aircraft Design	1983	
2022976-3-2	Improved Corrosion Protection	1996	3040-01-149-7445
2022976-5-1*	C/D Aircraft Design	1983	
2022976-5-2	Improved Corrosion Protection	1996	3040-01-151-2256
2022976-6-1*	C/D Aircraft Design	1988	
2022976-6-2	Improved Corrosion Protection	1996	3040-01-262-5537
2041812-1	A/B Aircraft Design	1981	5975-01-175-2032

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