FMC COMMANDER-15 CONTAINER/PALLET LOADER

TECHNICAL SUMMARY

CONVEY SYSTEM – The Commander-15 does not have belts and modules to move up and down. The FMC patented Heli-Roll system is powered by hydraulic motors that are easily accessible. The Heli-Rolls provide a totally positive deck no dead spots. Ease of maintenance and ease of operation are unmatched in the industry.

LIFT SYSTEM – The Commander is the only loader that uses the forklift style of lifting. This innovation provides a number of benefits. The forklift configuration is the most efficient method of lifting-the machine is "working smart" instead of "working hard". This method of lift does not induce the excessive frame stress of other lifting methods.

DRIVE POWER SYSTEM – The drive system has excellent maneuverability, allowing easy positioning around the aircraft. A twenty-six foot swept turning radius combines excellent maneuverability with unmatched stability. A three-speed range hydrostatic drive provides infinite speed adjustment, including inching at close range. The swing-out engine module provides superb accessibility to all engine components and main solenoid valve manifold system.

MODULARITY – The Commander is designed as a modular unit. It can be converted into a wide loader for 125-inch pallets, or the platform convey system can be reconfigured to provide increased transfer capability. A double scissors main deck capable configuration is also available as a modular option. This modular design provides the flexibility necessary to adapt to changing aircraft fleets.

HYDRAULIC SYSTEM – The Commander uses a closed center load sensing hydraulic system, using only the minimum horsepower necessary to operate at preset speeds, regardless of load. This keeps energy costs down and lowers maintenance costs.

ELECTRICAL SYSTEM – The electrical system uses common relays. Troubleshooting is made easier by optional status board with LED lights indicating the operation of most valves and relays. All limit sensing is by means of proximity switches. These weatherproof non-contacting switches lower maintenance costs and increase reliability of critical system interfaces.

DESCRIPTION

GENERAL

The COMMANDER loader is a single-operator, self -propelled vehicle capable of lifting and transferring cargo weighing up to 7,000 kilograms (15,500 lb). It can handle containers or pallets and service a broad range of aircraft.

The COMMANDER utilizes the latest in technology and incorporates modular power units, improved conveying system; electrical systems and logic element integrated hydraulic circuits. The use of light emitting diodes (Leeds) on a system status panel simplifies troubleshooting. Power units can be diesel, gasoline or 72-volt DC; the electrical system is a relay system, 24-volt DC; the hydraulic system is closed-center, and load sensing. Two hydraulic motors power the planetary drive wheels to propel the loader.

A number of features of the COMMANDER loader are available in different configurations. For instance, the rear platform can be supplied for end loading only, for right side and end loading or for right, left, and end loading. Other components are standard for all loaders. Some of the various configurations and features available are described in this section.

CAPABILITIES

The minimum rear platform height of 460 mm (18 in.) facilitates transfer of cargo from surface vehicles. The turning radius of 7.9 meters (26 ft) and inching capability of the propulsion system provide safe and precise control for positioning the loader. The maximum height to which cargo can be lifted is 3.55 meters (140 in). An optional double scissors assembly for the bridge can increase the lift height to 5.6 meters (220 in). Wide load capability is also available as an option.

MAJOR COMPONENTS

A. Chassis

The chassis is a rigid steel framework on which all other components are mounted. Two steerable drive wheels support the chassis at the front, and two bogy wheel assemblies, consisting of two wheels each, support the rear of the chassis. The drive wheels propel the chassis hydraulically by means of two planetary gear hubs. The bogy wheel assemblies are supplied with a hydraulic height adjustment. Brakes and steering are also hydraulically powered. During cargo transfer, the chassis is supported by six stabilizers that are hydraulically controlled to provide a stable platform for cargo transfer.

B. Bridge

The bridge, (also referred to as the forward platform) is raised and lowered by a scissors assembly that is powered by two hydraulic cylinders. The convey system, which consists of HeliRoll clusters assemblies and cylindrical rollers, provides for cargo movement in four directions.

The cluster assemblies provide the motive force that conveys the cargo. Each cluster assembly consists of a hub that supports six barrel-shaped rollers at an angle to the centerline of the hub.

Direction of roller assembly rotation is controlled by joysticks mounted on the operator's control panel. Power is supplied by shafts that are driven by hydraulic motors. In most cases, several shafts are driven by one motor via sprockets and roller chains.

When cargo is conveyed forward or rearward, all of the roller assemblies rotate in the same direction. For movement to either side, every other row of HeliRolls are driven in the opposite direction. The various combinations of rotation allow the operator to control cargo position or direction without being required to manually shift the load.

Two side guides on the bridge are hydraulically adjustable from side to side to assist in aligning cargo for transfer onto the aircraft. The front of the bridge is equipped with a folding wing so that the loader can be used to transfer cargo to or from aircraft with narrow door widths. The wing is manually raised or lowered, or may be optionally equipped with a hydraulic lifting and lowering mechanism.

The optional wide bridge has three hydraulically powered wings as standard features. The three wings allow great flexibility in transferring cargo to and from aircraft with varying door widths.

A double load stop is located at the rear of the bridge. This stop remains in the extended (up) position until the rear platform is at the same level as the bridge (at interface). The stop is mechanically operated and automatically prevents cargo movement off the bridge unless the rear platform is in a position to accept the cargo.

A hinged handrail is installed on the left side of the bridge.

Powered cylindrical rollers at the front of the bridge support and transfer cargo as it is conveyed on or off.

An optional double scissors assembly can be provided to increase the maximum lifting height of the bridge to 5.6 meters (220 in) thus providing main deck loading capability.

Other options include an aircraft following system (tracking sensor) that automatically adjusts bridge height to compensate for change in aircraft height as cargo is transferred. The automatic feature can be easily bypassed, if desired, so the operator can manually change bridge height as necessary. An optional bridge tilt assembly is also available to change the lateral slope of the bridge thus accommodating changes in aircraft pitch.

C. Operator's Compartment

The operator's platform contains all controls required to drive the loader and transfer cargo. The stand-up design offers maximum visibility as well as safe, convenient, and comfortable access to loader and aircraft controls. The compartment is hydraulically adjustable fore and aft to allow the operator to gain access to aircraft controls during cargo transfer.

Controls and indictors used to drive the loader and position cargo are located on two panels on the console. Gauges and indictors are placed on the driver's control panel so that operation of the loader can be monitored. Controls for propulsion speed and direction are also included. An accelerator pedal proportionally controls the speed of the loader. The proportional control feature allows precise positioning of the loader and provides inching capability as the aircraft is approached. A pedal separate actuates the hydraulic service brakes.

On the operator's control panel are the switches used to position and transfer the cargo, to raise and lower the rear platform and to operate the side and rear stops. An emergency stop button located on this panel will shut down power unit and all functions. Handrails are integral part of the compartment for operator safety during operation of the loader.

D. Rear Platform

The rear platform is also raised and lowered by a scissors assembly; however, it is powered by one primary hydraulic cylinder and two secondary cylinders that operate in conjunction with four leaf-chain assemblies to position the platform.

Depending on the configurations of the platform purchased, a Heli-Roll system similar to that of the bridge may be used. Hydraulically operated stops prevent unintentional off loading of cargo.

Various rear platform configurations are available, allowing right or left side container or pallet transfer and side shifting. Some platforms equipped with Heli-Rolled assemblies include a feature that allows containers or pallets to be rotated as required to align them for cargo transfer.

Other options included LD-1 or LD-3 load stops, truck height transfer capability, and extension deck adapters.

E. Power Unit

The power unit is located at the front of the loader. It is a modular unit that is hinged on the right side of the loader. A single bolt on the left side can be removed to permit the module to swing out for complete access to components when maintenance is required. A power panel on the right side of the module contains controls and indictors used to start and operate the power unit at ground level. An emergency stop button is also located at ground level.

A choice of several diesel engines, a gasoline engine, or a 72-volt DC battery system is available as the primary source of power for the loader. Engines and battery system are easily interchangeable at field level--no major modifications to the loader are required.

F. Hydraulic System

The hydraulic system of the Commander-15 loader is open loop, closed center, and load sensing. A single variable displacement axial piston pump which is coupled directly to the power unit, supplies oil to all hydraulic systems of the loader, including propel, steering, brakes, lift and convey.

An electrically driven emergency pump is provided to allow the operator to lower the platform, raise the stabilizers, and perform other emergency produces if the power unit or main pump fail.

Two integrated hydraulic circuit manifolds are used in place of individual valve assemblies. Integrating the value cartridges into common manifold bodies reduces external plumbing and its related potential for leaks and contamination. The large internal passageways between cartridges in these manifolds reduce pressure drop for a more efficient system. High flow rate OFF/ON logic element cartridge valves are used in place of spool valves (with their inherent high pressure drop and high internal leakage) in the propel and platform lift circuits. The same logic elements that control propel direction also provide dynamic braking to give a smooth and positive deceleration when the accelerator is released. The

benefits of this type valve system are high flow with low pressure drop, and zero leakage because of the metal to metal line contact seal.

The same manifolds used on the Commander-15 with 30 GPM are used on the Commander-30 with 62 GPM. The only difference is one internal part in the proportional valve cartridge. This commonality of parts reduces the customers inventory.

G. Electrical System

The 24 V DC electrical system provides power for the engine starter and ignition (12 V DC for gas engines), hydraulic valves, light and signals and other accessories. Power is derived from two 12-volt batteries (connected in series) as the basic 24-volt electrical system. An engine-driven alternator maintains battery charge.

The electrical system uses common relays which are either socket mounted or tab mounted. The location of electrical panel and junction boxes allow the user flexibility in adding features, upgrades, and ease in troubleshooting.

Troubleshooting can be performed by anyone with basic understanding of schematic reading and voltmeter, and since each major area of the loader has its own junction box, isolating problems is quicker.

A diagnostic troubleshooting status panel is offered as an option. This panel can be used to show the working status of individual components by using high intensity l,e.d.'s (light emitting diodes), thus quickly showing the operator which area to look at for fixing any faults that may occur.

Modular diode modules are also an important feature of the electrical system. These modules isolate certain functions such as: 1) Platform front section convey, 2) Platform rear section convey and 3) Bridge convey. These modules can be quickly replaced if needed and inexpensively repaired, saving both time and money.

Overall, the electrical system makes it easier to maintain by: 1) Providing the user with inexpensive parts which can be individually replaced without affecting other systems on the loader. 2) Providing accessible junction boxes in key areas. 3) Superb documentation of the electrical system such as schematics. 4) Using familiar, user friendly technology.

SPECIFICATIONS

1. PERFORMANCE

Lift capacity	7,000 kg (15, 000 lb)
Load capacity	Two containers (LD-3) (or similar in dimensions) or one pallet 3.17 m x 2.4 m (125 in. x 96 in.)
Platform lift speeds	
Rear platform	13.7 m/min (45 fpm)
Front platform	4.6 m/min (15 fpm)
Minimum transfer height	
Rear Platform	0.46 m (18 in.)
Bridge	1.74 m (68.5 in.)
Maximum transfer height	
Rear Platform and Bridge (Standard)	3.55 m (140 in.)
Bridge (Main Deck Capable)	5.6 m (220 in.)
Conveying speed	18.3 m/min (60 fpm)
Drive speed (maximum)	11 km/hr (7 mph)
Stopping distance (full speed)	4.6 m (15 ft) approx.
Turning radius (swept)	7.9 m (26 ft)
Operating temperature (ambient)	-32 to 52 C (-25 to 125 F)
Wind speed (maximum during operation)	73 km/hr (45 mph)
Wind speed (withstand)	161 km/hr (100 mph)

2. POWER UNIT DATA

Engines

MODEL	# OF CYL	COOLING	IDLRPM DTRPM BPH*	FUEL	DISPLACEMENT
			1400 2400		
Perkins 1004	4	Liquid	78	Diesel	3.86 L (286 in3)
			1400 2400		
Deutz 1012	4	Air	68	Diesel	3.77 L (230 in3)

*Idle RPM/Demand Throttle RPM/Horsepower @ Demand Throttle

3. HYDRAULIC SYSTEM

Closed center, load sensing

Filters:	Breather/filter	Replaceable
	Return	Replaceable
	Pump Case Drain	Replaceable
	Motor Case Drain	Replaceable
	High Pressure (Option)	Replaceable

Hydraulic oil	Mobil DTE 11 or equivalent
Operating Temperature (Ambient)	-32 to 52 C (-25 to 125 F)
Main Pump Displacement	7 cc/REV (4.33 in3/REV)

Emergency Pump Rating [Electrically Powered]		7.6 L/min @ 204 BAR

4. ELECTRICAL SYSTEM

Alternator capacity		24 VDC (70 amp max)
Battery		2 (two) 12 VDC connected in series

5. BRAKE SYSTEM

Drive wheels:	Parking	Spring supplied hydraulically released
	Service	Hydraulically applied
	Fluid	Hydraulic

6. WHEELS AND TIRES

Drive wheels:	Wheels	8.00 BD x 15
	Tires	Solid, (or optional pneumatic) 300 x 15 NHS 20 ply
Bogy wheels (rear)		Solid
Steering		Hydraulically actuated, power assisted
Maximum steering angle		43
Drive hubs:	Type	Planetary torque hubs
	Model	Fairfield Mfg. W2B2 (assy.#W2b@FO337N)

7. CAPACITIES

Fuel		121 L (32 gal) total
	Gasoline	Unleaded regular
	Diesel	#2 Diesel
Engine coolant		Varies with engine
Engine oil		Varies with engine
Planetary hub (oil EP-90 or equivalent)		503 cc (17 oz. approx.)
Hydraulic fluid:	Reservoir	190 L (50 gal.)
Plumbing and Components		114 L (30 gal.)

Total Hydraulic Fluid	304 L (80 gal.)

8. WEIGHT AND DIMENSIONS

Weight	14,970 kg (33,000 lb) and up, (depending on features supplied)
Wide	15,900 kg (35,000 lb)
Universal	16,780 kg (37,000 lb)
Length	8.66 m (341 in.)
Width (with Operator's Cab)	
(Standard platform)	3.66 m (144 in.)
(Wide platform)	4.22 m (166 in.)
Height (with Handrails)	
(Standard)	2.90 m (114 in.)
(Main Deck)	3.60 m (122 in.)
Wheel base	3.25 m (128 in.)
Cube	47 m3 (1644 ft3)