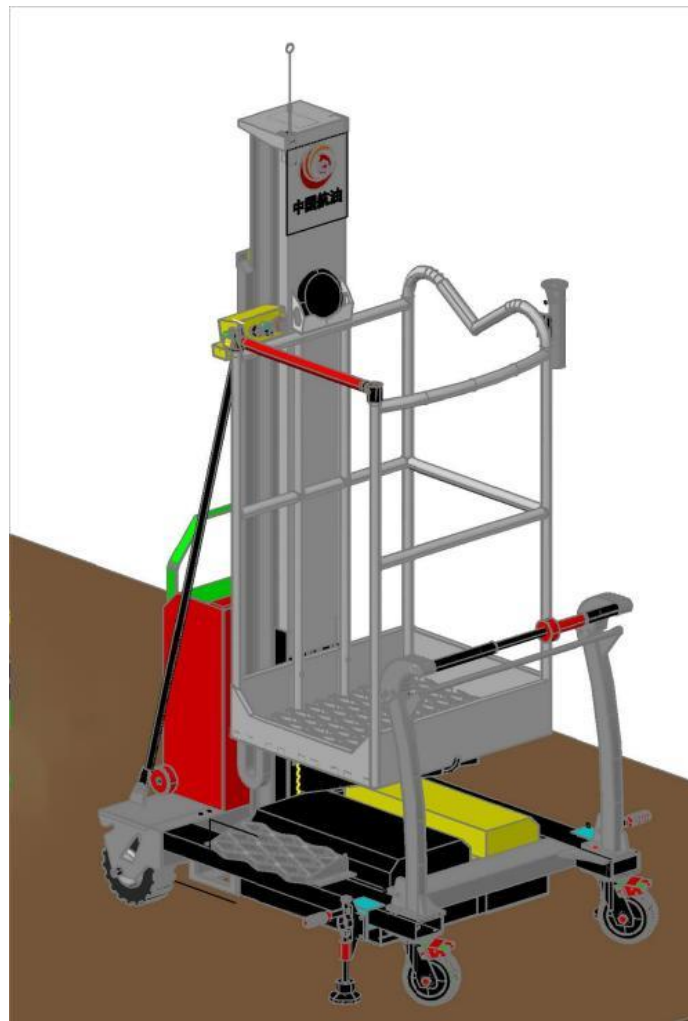


Multi-functional Assisted Refueling Ladder

Product and Operation & Aintenance Manual





Chapter 1 Overview of Refueling Ladder

1.1 Description

This manual provides a detailed description of the structure, functions, components, and other basic data of the multi-functional assisted refueling ladder (hereinafter referred to as the refueling ladder).

1.2 Basic Specifications of Refueling Ladder

Product Model	DPT-190A
Product Name	Multi-functional Assisted Refueling Ladder
Length [mm]	1200
Width [mm]	920
Height [mm]	2150
Net Weight [kg]	168
Rated Load [kg]	125
Maximum Load [kg]	150
Extreme Temperature Range [°C]	-20-60
Lifting Height [m]	1.9

Circuit Control System

Battery Capacity	[AH]	100
Power Supply Voltage	[V]	DC 24 V
Rated Power	[kW]	0.8
Chain Replacement Cycle	Year	3
Theoretical Lifting Cycles of the Battery	Times	400
Charging Time	Hour	4

Pneumatic Lifting Device

Cylinder Specification	Unit	Model T6063-32
Load Capacity	[kg]	240

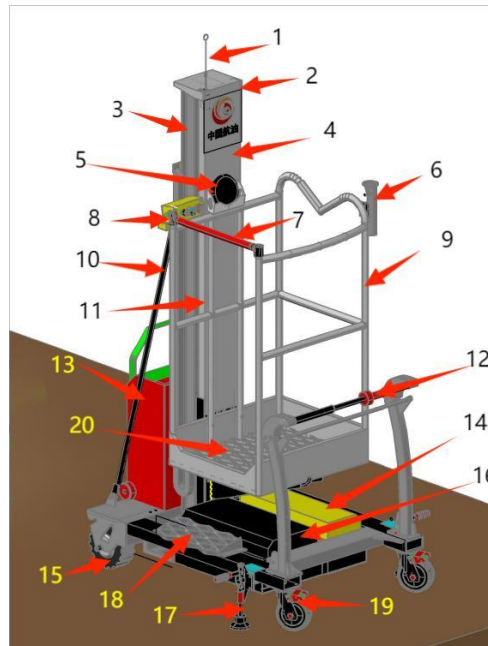
1.3 Safety Signs

The following safety warning signs on the refueling ladder indicate very important information and instructions. If damaged, they must be replaced promptly.

- 
必须戴防护手套 Standard Personal Protective Equipment
- 
当心坠落 Caution: Falling Hazard
- 
当心机械伤人 Caution: Mechanical Injury
- 
当心火灾 Caution: Fire Hazard
- 
禁止伸入 No Entry
- 
禁止跳下 No Jumping Off

Chapter 2: Detailed Component Diagrams and Tables of Refueling Ladder

2.1 Basic Components of Refueling Ladder

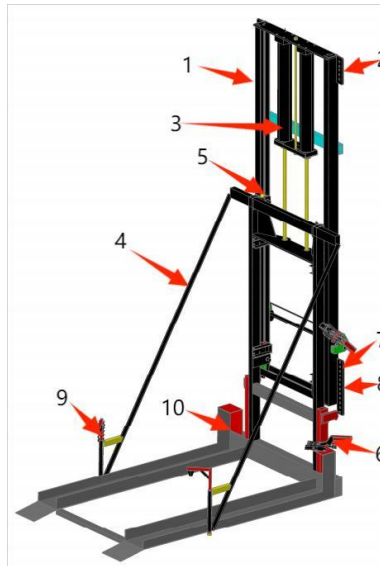


Main Components of Refueling Ladder

No.	Component Name	Specification Model & Material	Quantity	Unit	Remarks
1	Proximity Switch	YBLX-ME8166	1	Unit	
2	Rain Cover	T6063-220	1	Unit	
3	Profile Slide Rail	T6063-1880	1	Piece	
4	Sliding Profile	T6063-515	1	Piece	
5	Fuel Tank Cap Tray	T6063-200	1	Unit	
6	Nozzle Holder	SUS40-50	1	Unit	
7	Door Rod	T6063-32	1	Piece	
8	Button Box	T6063-210	1	Set	
9	Platform Guardrail	T6063-32	1	Set	
10	Diagonal Tie Rod	SUS304-25	2	Pieces	
11	Drive Chain	SUS304-08B-2	1	Chain	
12	Control Handle	ABS	1	Set	
13	Battery Pack	Lithium Iron Phosphate	1	Set	
14	Drive Motor	J130ZYT108-RV63-80/ZD	1	Set	

No.	Component Name	Specification Model & Material	Quantity	Unit	Remarks
15	Drive Wheel	HB-8IN	2	Sets	
16	Electrical Assembly	Custom-made	1	Set	
17	Support Plate	T6063-32	2	Sets	
18	Anti-slip Foot Pedal	T6063-32	1	Set	
19	Braked Swivel Caster	6-inch Nylon	2	Sets	
20	Lifting Platform		1	Set	

Components of Pneumatic Lifting Device



No.	Component Name	Specification Model & Material	Quantity	Unit
1	Pneumatic Frame Body	A3	1	Set
2	Mounting Plate	A3	1	Set
3	Cylinder	T6063-32	2	Sets
4	Pulley Diagonal Tie Rod	A3	2	Sets
5	Pulley	Nylon	4	Sets
6	Fixed Plate Machine	A3	2	Sets
7	Pneumatic Valve	T6063-32	1	Set
8	Pneumatic Valve Mounting Plate	A3	1	Set
9	Elastic Pressure Foot	SUS304	2	Sets
10	Movable Frame	A3	1	Set

Operation and Maintenance Manual



Chapter 1 Product Overview

1.1 Foreword

This manual provides a detailed description of the structure, functions, basic operation, and maintenance of the multi-functional assisted refueling ladder (hereinafter referred to as the refueling ladder).

1.2 Safety Precautions

1.2.1 Signs and Their Meanings

The following signs on the vehicle body indicate very important information and instructions. If damaged, they must be replaced promptly.

-  Caution: Flammable and Explosive
-  No Open Flames
-  No Smoking



1.3 Main Purpose of Refueling Ladder

This refueling ladder can be used with tank refueling vehicles to provide fuel dispensing services for aircraft. This refueling ladder cannot be used on public roads. Operators must comply with national regulations for using this refueling ladder at airports. Refueling operations can be performed by one person. This refueling ladder offers the following features:

- Integrated design of the refueling ladder and tank refueling vehicle ensures effective coupling between the refueling ladder and the refueling vehicle.
- Suitable for all types of C-class aircraft within the full range of heights.
- Reduces the dragging intensity of the refueling hose and the lifting/lowering intensity of the refueling nozzle, effectively reducing labor intensity during refueling and enhancing safety during nozzle connection and disconnection operations.

1.4 General Safety Precautions

Personnel operating this refueling ladder must be trained and familiar with this manual. In addition to the safety precautions mentioned in this manual, the following relevant safety requirements must also be given importance:

- Industry, national, and international standards, regulations, and requirements.
- Local regulations of the airport where the refueling ladder is located.

Any modification to this refueling ladder must be consulted with China Aviation Oil East China Company in advance.

The refueling ladder must be equipped with a manual in the vehicle for ready reference and problem-solving.

1.5 Personnel Safety Responsibilities

1.5.1 Refueling Ladder Equipment Manager

The equipment manager refers to the personnel responsible for managing the refueling ladder.

1.5.2 Obligations of the Refueling Ladder Equipment Manager

The refueling ladder manager or their supervisor must take the following preventive measures:

- Must be aware of all relevant directives, regulations, laws, and rules.
- Only qualified personnel are allowed to operate the refueling ladder.
- Relevant operators must strictly follow the requirements of this manual.

1.5.3 Pre-operation Work

Before activating the refueling ladder, the equipment manager must strictly follow these steps:

- Consult the refueling ladder's technical manual and operating procedures.



- Check the integrity of the refueling ladder.
- Check the stability of the refueling ladder when attached to the vehicle.
- Check the battery level of the refueling ladder.
- Check the effectiveness of the refueling ladder's anti-collision bumper.

1.5.4 Daily Work of the Equipment Manager

The equipment manager must comply with the following operations:

- The refueling ladder must be parked in an appropriate operating area.
- The refueling ladder must be regularly maintained (routine maintenance).
- All safety devices must be regularly inspected (routine inspection).

1.5.5 Qualified Personnel

Qualified personnel refer to authorized individuals who meet the requirements, possess experience, have received training, are aware of accident prevention regulations and operating procedures, can identify and prevent potential hazards, and fully understand this manual.

Chapter 2 Operation Instructions for Multi-functional Assisted Refueling Ladder

2.1 Basic Operation Steps of Refueling Ladder

(1) Ladder Retrieval Steps



1



2



3

- 1 Open the locking device.
- 2 Use the rocker arm to control the ladder to descend while opening the side lock.
- 3 Push out the refueling ladder to proceed with the next refueling operation.

(2) Positioning and Refueling

- 1 Push the refueling ladder to below the aircraft's refueling port.



- 2 Extend the outriggers on both sides of the refueling ladder smoothly to the ground to increase stability.



- 3 Drag the refueling hose onto the refueling ladder and secure it.



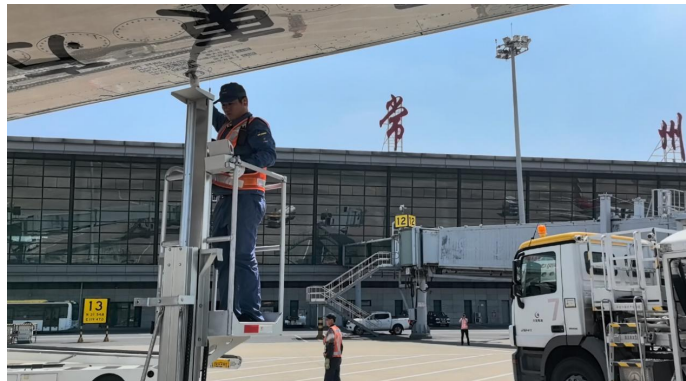
- 4 Open the safety bar of the guardrail, operators enter the refueling platform, and close the safety bar to activate the quick-lock device, while simultaneously linking the upper control operation button to prepare for refueling operations.



- 5 After refueling is complete, re-board the ladder.



- 6 Remove the hose and place it on one side of the ladder, then close the refueling port cover.



- 7 After dismounting the ladder, remove the hose and return it to the refueling vehicle.



- 8 Finally, push the refueling ladder to the rear of the refueling vehicle for coupling.



(3) Loading After Refueling



1



2



3

- 1 Push the refueling ladder to the coupling bracket.
- 2 Control the bracket to rise to the appropriate position using the rocker arm.
- 3 Secure the locking device to complete the loading.

(4) Safety Operating Procedures for Multi-functional Assisted Refueling Ladder

Equipment Name	Multi-functional Assisted Refueling Ladder	Procedure Name	Safety Operating Procedures for Multi-functional Assisted Refueling Ladder	Version No.: V1.0
Standard Personal Protection		Risk Warning Signs		

Emergency Response

- 1 In case of personnel falling or mechanical injury, on-site personnel must immediately provide first aid and call 120 to contact emergency services.
- 2 Emergency response should be carried out according to the on-site emergency plan, organizing scientific rescue.



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Before Operation

No.	Step	Hazardous Factors & Risks	Possible Injuries	Protective Measures	Remarks
1	Consult the refueling ladder's technical manual and operating procedures.	Failure to consult the technical manual and operating procedures; unfamiliarity with emergency measures.	Other injuries	Consult the refueling ladder's technical manual and operating procedures, and be familiar with on-site emergency measures.	
2	Check the integrity of the refueling ladder.	Failure to promptly detect structural defects or missing components; mechanical injury.	Falls from height, mechanical injury, other injuries	Thoroughly inspect the integrity of the refueling ladder according to the technical manual and operating procedures, including but not limited to the integrity of personnel protective guardrails, the secure fastening of platform traction chains and drive gears, and the effectiveness of gear and chain engagement; strictly prohibit hands or other body parts from entering narrow mechanical gaps.	
3	Check the stability of the refueling ladder when attached to the vehicle.	Pneumatic lifting device and refueling ladder overturning; locking buckle not effectively locked.	Object impact	Thoroughly inspect the connection stability of the pneumatic lifting device with the vehicle body and the stability of the refueling ladder according to the technical manual and operating procedures; fasten the refueling ladder's locking buckle according to operating procedures.	
4	Check the battery level of the refueling ladder.	Battery level below the threshold for operational assurance (minimum).	Other injuries	Ensure the refueling ladder's battery level is above the threshold for operational assurance (minimum).	
5	Check the effectiveness of the refueling ladder's anti-collision bumper.	Personnel falling.	Falls from height	Test the effectiveness of the anti-collision bumper according to the technical manual and operating procedures.	

During Operation

No.	Step	Hazardous Factors & Risks	Possible Injuries	Protective Measures	Remarks
1	Release the pneumatic lifting device, separate the refueling ladder from the lifting device.	Misuse of electric drive device leading to uncontrolled movement of the refueling ladder; unsupported outriggers causing the refueling ladder to slide and injure personnel.	Other injuries	Operators should first operate the pneumatic lifting device's directional valve to the upward position according to the refueling ladder's operating procedures, separating the pneumatic lifting device from the suspended position, and the pneumatic lifting device's base plate foot; open the locking buckles in the middle and bottom of the refueling ladder to detach the refueling ladder from the refueling vehicle body, then operate the pneumatic lifting device's directional valve to the downward position, ensuring the standing position avoids the descending position of the pneumatic lifting device's tray; operate the pneumatic lifting device to descend to the lower limit position according to operating procedures.	
2	Push the refueling ladder to the operational position, extend and lock both outriggers.	Misuse of electric drive device leading to uncontrolled movement of the refueling ladder; unsupported outriggers causing the refueling ladder to slide and injure personnel.	Other injuries	Operators should manually push the refueling ladder to the operational position. If an electric drive device is used, strictly control the drive speed and direction. Electric drive devices are strictly prohibited when within 3 meters of an aircraft engine. After reaching the operational position, manually extend and lock both outriggers.	
3	Drag the refueling hose to the appropriate position, and hang the refueling nozzle on the designated refueling nozzle holder of the refueling ladder.	Personnel tripping over the hose.	Other injuries	Properly drag the refueling hose to the appropriate position and hang the refueling nozzle on the designated refueling nozzle holder of the refueling ladder.	
4	Lift the platform to refueling height, connect the refueling nozzle.	Lifting platform colliding with aircraft wing; personnel falling.	Other injuries, falls from height	Operators board the platform, lock the entrance guardrail, and operate the upward button of the electric platform lifting device according to operating procedures. The platform rises, and the refueling hose rises simultaneously. When the platform reaches the appropriate height,	

No.	Step	Hazardous Factors & Risks	Possible Injuries	Protective Measures	Remarks
				release the upward button, and the aircraft refueler connects the refueling nozzle.	
5	Operate the platform to descend, start refueling.	Misoperation of directional valve causing the platform to continue rising and collide with aircraft wing; personnel falling.	Other injuries, falls from height	Operators operate the downward button of the electric platform lifting device according to the refueling ladder's operating procedures, while observing the refueling nozzle connection. When descending to the lower limit, the aircraft refueler releases the downward button, dismounts from the refueling ladder platform to the refueling vehicle's operational position, and begins refueling.	
6	After refueling, lift the platform to refueling height, remove the refueling nozzle, hang it on the designated position on the refueling ladder, and lower the platform to the lower limit.	Refueling nozzle slipping from hand and causing injury; personnel falling.	Other injuries, falls from height	Repeat step 4 to refueling height. After removing the refueling nozzle, immediately hang it on the designated refueling nozzle holder of the refueling ladder. Operate the downward button of the electric platform lifting device; the nozzle descends with the platform. When descending to the lower limit, the refueler releases the downward button, removes the refueling nozzle from the refueling ladder, and retracts the hose.	
7	Move the refueling ladder to the pneumatic lifting device tray.	Failure to retract outriggers causing personnel injury.	Other injuries	Manually release both outriggers. Operators use manual force to push the refueling ladder to the retrieval position. If an electric drive device is used, strictly control the drive speed and direction.	
8	Operate the pneumatic lifting device to securely lock the refueling ladder to the refueling vehicle.	Refueling ladder not securely connected to the pneumatic lifting device, causing overturning and injury.	Object impact	Operators operate the pneumatic lifting device's directional valve to the upward position according to operating procedures. When the lifting device rises to the appropriate position, operate the directional valve to allow the pneumatic lifting device and refueling ladder to self-engage into the suspended position, and lock the middle and bottom locking buckles of the refueling ladder to securely lock the refueling ladder to the pneumatic lifting device.	

After Operation

No.	Step	Hazardous Factors & Risks	Possible Injuries	Protective Measures	Remarks
1	Check the stability of the refueling ladder when attached to the vehicle.	Pneumatic lifting device and refueling ladder overturning; locking buckle not effectively locked.	Object impact	Thoroughly inspect the connection stability of the pneumatic lifting device with the vehicle body and the stability of the refueling ladder according to the technical manual and operating procedures; fasten the refueling ladder's locking buckle according to operating procedures.	
2	Check the battery level of the refueling ladder.	Battery level below the threshold for operational assurance (minimum).	Other injuries	Ensure the refueling ladder's battery level is above the threshold for operational assurance (minimum).	
3	Check the integrity of the refueling ladder.	Failure to promptly detect structural defects or missing components.	Falls from height, other injuries	Thoroughly inspect the integrity of the refueling ladder according to the technical manual and operating procedures, including but not limited to the integrity of personnel protective guardrails, the secure fastening of platform traction chains and drive gears, and the effectiveness of gear and chain engagement.	
4	Battery charging.	Failure to charge the battery according to safety management requirements.	Fire	When the refueling ladder battery needs charging, disconnect the aviation plug on the battery output cable, remove the battery from the refueling ladder battery compartment, move it to a safe area, and charge it according to the company's battery charging safety management system.	

Notes:

- 1 Before operating the multi-functional assisted refueling ladder, please read the operating procedures carefully to understand and master the main risks and corresponding protective measures.
- 2 Please operate strictly according to the operating procedures. If the equipment shows abnormal conditions, do not operate blindly; please contact maintenance personnel.
- 3 If new risks are discovered during operation, please promptly report them to department leadership.



Chapter 3 Refueling Ladder Maintenance Instructions

Battery Maintenance:

- 1 The battery should be charged promptly when the charge level is below 20%. Each charging cycle takes approximately 4 hours, and the equipment has an automatic protection function.
- 2 The charging port has a protective cover, which should be closed after charging.
- 3 The main power switch should be pressed when the refueling ladder is stored.
- 4 Use a dedicated charging cabinet with a fire extinguishing system and plan an appropriate charging location.

Chain Maintenance: Regularly lubricate the refueling ladder chain with special lubricating oil for periodic maintenance. Apply lubricant evenly and remove excess oil. Check chain tension and keep it within the specified range. It is recommended to replace the chain every 3 years.

Daily Inspection of Refueling Ladder (Static and Dynamic Inspection) is as follows:

Static Inspection:

- 1 Check the overall appearance of the refueling ladder for integrity;
- 2 Check the effectiveness of the refueling ladder's casters brakes and outriggers;
- 3 Check the integrity of the refueling ladder's entrance guardrail;
- 4 Check if the refueling ladder's battery level meets requirements;
- 5 Check the integrity of the refueling ladder's battery switch;
- 6 Check the integrity of the refueling ladder's platform traction chain;
- 7 Check the secure fastening of the refueling ladder's platform drive gears and bearings.

Dynamic Inspection:

- 1 Check if the refueling ladder's lifting/lowering switch operates normally and effectively, and if the drive gears and traction chain engage reliably;
- 2 Check if the refueling ladder's upper limit travel switch is effective, and if the anti-collision bumper is effective (two-person inspection);
- 3 Check if the refueling ladder's vehicle coupling mechanism operates normally, and if the locking device is normal.



Safety Notes:

- 1 Personal protective equipment, such as safety helmets, protective clothing, and anti-slip shoes, must be worn before operation.
- 2 Strictly prohibit operations unrelated to refueling during refueling operations to ensure full concentration.
- 3 During the lifting or lowering of the refueling ladder, operators should maintain a safe distance to avoid collisions or crushing.
- 4 In case of emergency, immediately press the emergency stop button, cut off the power, and take appropriate measures to ensure the safety of personnel and equipment.

Refueling Ladder Warranty Information: Damage to the multi-functional refueling ladder caused by any of the following circumstances is not covered by the warranty:

- 1 Improper operation of the multi-functional refueling ladder;
- 2 Operating the multi-functional refueling ladder when it has functional defects or safety devices are not installed;
- 3 Failure to operate the refueling ladder according to the manual's requirements;
- 4 Unauthorized modification of the refueling vehicle or its components;
- 5 Failure to perform maintenance and upkeep as required;
- 6 Incorrect use of the refueling ladder;
- 7 Improper repair;
- 8 Force majeure.

Conclusion

China Aviation Oil's tank refueling vehicles and their 配套 (matching) multi-functional exoskeleton robotic arm automatic refueling ladders are important equipment for modern aviation refueling. This manual aims to provide users with detailed and standardized operating guidelines to ensure safe and efficient refueling operations. Users are requested to strictly follow the manual's requirements for operation and perform regular maintenance to ensure the long-term stable operation of the equipment.