TECHNICAL MANUAL

CLEANING AND CORROSION PREVENTION AND CONTROL, AEROSPACE AND NON-AEROSPACE EQUIPMENT

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This manual incorporates Safety Supplement, TO 1-1-691 SS-4, dated 21 August 2021.

BASIC AND ALL UPDATES HAVE BEEN MERGED TO MAKE THIS A COMPLETE PUBLICATION.

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2 NOVEMBER 2009 **CHANGE 19 - 22 JULY 2022**

3.4 CLEANING EQUIPMENT.

CAUTION

- Do not use high pressure spray nozzles to apply cleaning compounds. Cleaning compounds shall only be applied using a low pressure soap nozzle. High pressure can cause cleaning compounds to become entrapped in enclosed area causing corrosion.
- High pressure wash equipment shall never be used on aircraft landing gear and components, wheels, and brakes as they can force lubricants out of bearings and attach points and cause corrosion and wear problems.

NOTE

- Use only cleaning materials and equipment authorized and described in this manual. Experimentation with unauthorized cleaners may damage aircraft, missiles, and equipment thus reducing reliability and increasing maintenance costs.
- Cleaning equipment specific to one type of aircraft, missile, or piece of equipment is not covered by this manual. Approved equipment for general cleaning is discussed in this manual and ordering information is presented in Appendix B of this manual. General operating instructions are in Paragraph 3.4.1 through Paragraph 3.4.9. See specific equipment operating manuals for detailed equipment operating instructions.

3.4.1 High Pressure/Hot Water Wash Equipment. If approved by the aircraft SPD and/or the equipment SPM, high pressure/hot water wash equipment can be used for general purpose cleaning of aircraft, support equipment, and vehicles. These machines can deliver four gallons per minute of water and/or cleaning solution at a temperature of 210° F and a pressure of 3000 PSI at the attach points on the machine for each output hose. These machines shall be operated per these instructions and the directions in the specific equipment operating manual.

a. Fill the cleaner reservoir with only approved cleaning compounds.

b. Set the water cleaning compound mixture ratio to fifty parts water to one part cleaner.

c. Use only 40° flat fan spray nozzles.

d. Ensure that the nozzle stand-off distance to the surface is always at least 12 inches and never less.

NOTE

- Pressure and temperature at the nozzles will be less than at the hose attach points on the machine due to losses in the hoses.
- This equipment may remove any loose sealant and/or paint.

3.4.2 Portable, 15 Gallon, Foam Generating, Cleaning Unit. This cleaning unit is compact, portable, light, and ideal for cleaning hard to reach areas. It consists of a 54 inch applicator wand, 50 feet of hose, and a 15 gallon tank mounted on a frame with rubber tire wheels. (Refer to Figure 3-1). The control system allows the operator to adjust the foam wetness to fit any job. The cleaning unit provides a foam capable of clinging to vertical surfaces to soften and dislodge soils. These machines shall be operated per these instructions and the directions in the specific equipment operating manual.

WARNING

Do not service the portable 15 gallon foam generating cleaning unit without releasing the tank pressure.

CAUTION

When the cleaning task is completed, drain and flush the tank with fresh water to prevent forming an extremely concentrated solution by pouring additional cleaner into the solution remaining in the tank which could damage the equipment being cleaned.

a. Release the tank pressure prior to servicing and remove the tank fill cap. Fill the tank with an authorized, pre-diluted cleaning solution while leaving an adequate air space at the top of the tank. Replace the tank fill cap.

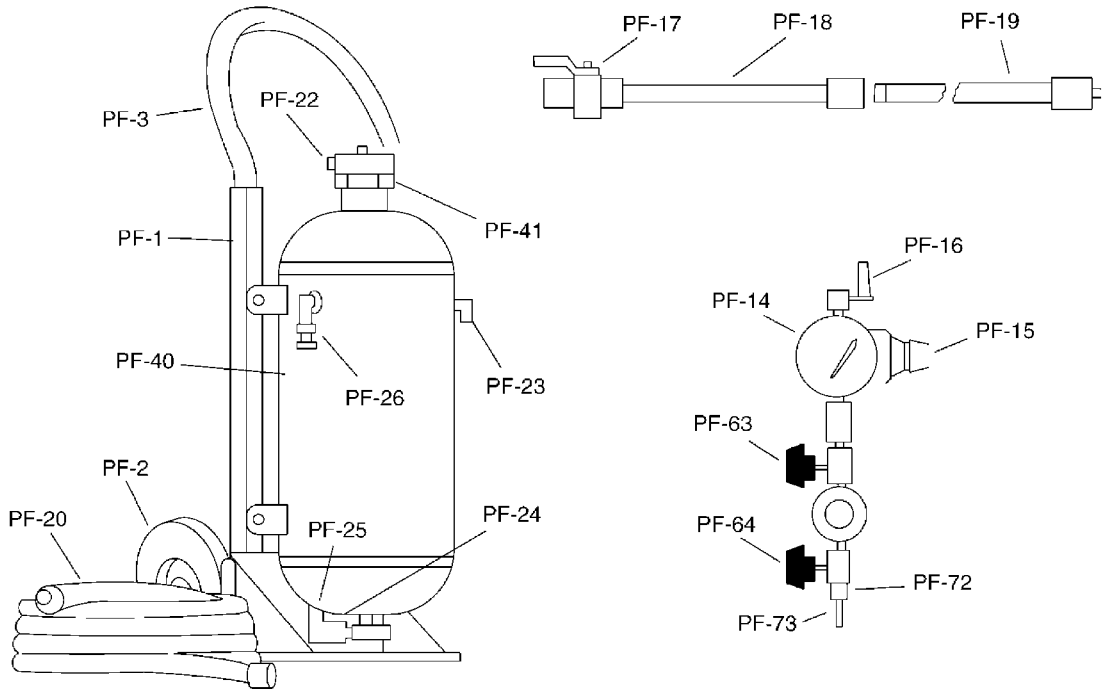
b. Connect the air supply hose to the air inlet valve on the air regulator.

NOTE

Refer to Table 3-2 for the proper cleaner to water mix ratio.

c. Open the cleaning compound metering valve and the air inlet valve to the full, open position and set the air regulator to a pressure within the range of 30 to 70 PSI.

d. Open the foam discharge valve while directing the nozzle at the surface to be cleaned.



TANK CAPACITY:	15 GALLONS
TANK DIMENSIONS:	16 IN LONG X 17 IN WIDE X 42 IN HIGH
TANK WEIGHT (EMPTY):	68 POUNDS
COMPRESSED AIR PRESSURE:	40-110 PSI
FILLER HATCH OPENING:	3-1/4 IN
AIR LINE INLET:	1/4 IN (USE 3/8 IN OR 1/2 IN AIR LINE)
CFM REQUIRMENTS:	15 CFM
TANK CONSTRUCTION:	STAINLESS STEEL
FOAMING HOSE DIMENSIONS:	5/8 IN ID X 50 FT LONG, 200 PSI
SAFETY RELIEF VALVE:	125 PSI

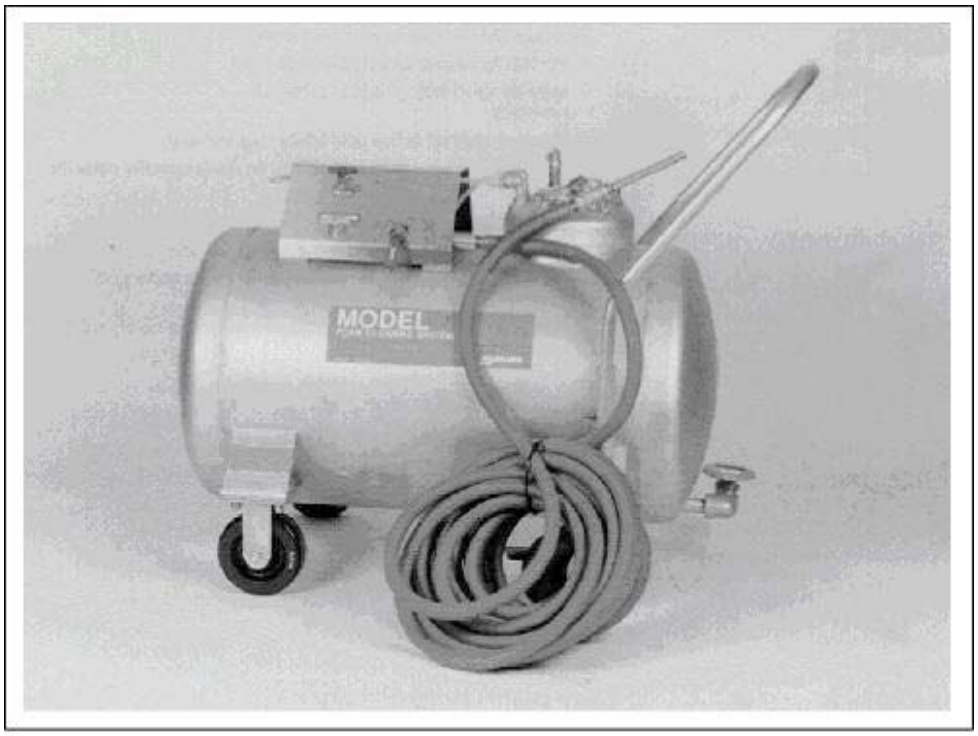
PN	DESCRIPTION	PN	DESCRIPTION	PN	DESCRIPTION
PF-1	PORTABLE CARRAGE	PF-18	SHORT WAND	PF-26	AIR BLEED VALVE
PF-2	WHEEL	PF-19	WAND EXTINSION	PF-40	COMPOUND TANK (15 GAL)
PF-3	CURVED HANDLE	PF-20	APPLICATION HOSE	PF-41	TANK CAP GASKET
PF-14	PRESSURE GAUGE	PF-22	TANK FILL CAP	PF-63	AIR METERING VALVE
PF-15	AIR REGULATOR	PF-23	SAFETY VALVE	PF-64	COMPOUND METERING VALVE
PF-16	AIR INLET VALVE	PF-24	CHECK VALVE	PF-72	SK FITTING (F)
PF-17	FOAM DISCHARGE VALVE	PF-25	SK FITTING (M)	PF-73	SS TUBING

NOTE

REPLACMENT PARTS NOT AVAILABLE BY NSN. ORDER FROM MANUFACTURER.

TO-1-1-691-024

Figure 3-1. Foam Generating Cleaning Unit (15 Gallons)



TANK CAPACITY:	45 GALLONS
TANK DIMENSIONS:	48 IN LONG x 27 IN WIDE x 37 IN HIGH
TANK WEIGHT (EMPTY):	175 POUNDS
COMPRESSED AIR PRESSURE:	40-110 PSI
FILLER HATCH OPENING:	3-14 IN
AIR LINE INLET:	1/4 IN (USE 3/8 OR 1/2 IN AIR LINE)
CFM REQUIREMENTS:	15 CFM
TANK CONSTRUCTION:	STAINLESS STEEL
FOAMING HOSE DIMENSIONS:	5/8 IN ID x 50 FT LONG, 200 PSI
SAFETY RELEIF VAVLE:	125 PSI

Figure 3-2. Foam Generating Cleaning Unit (45 Gallons)

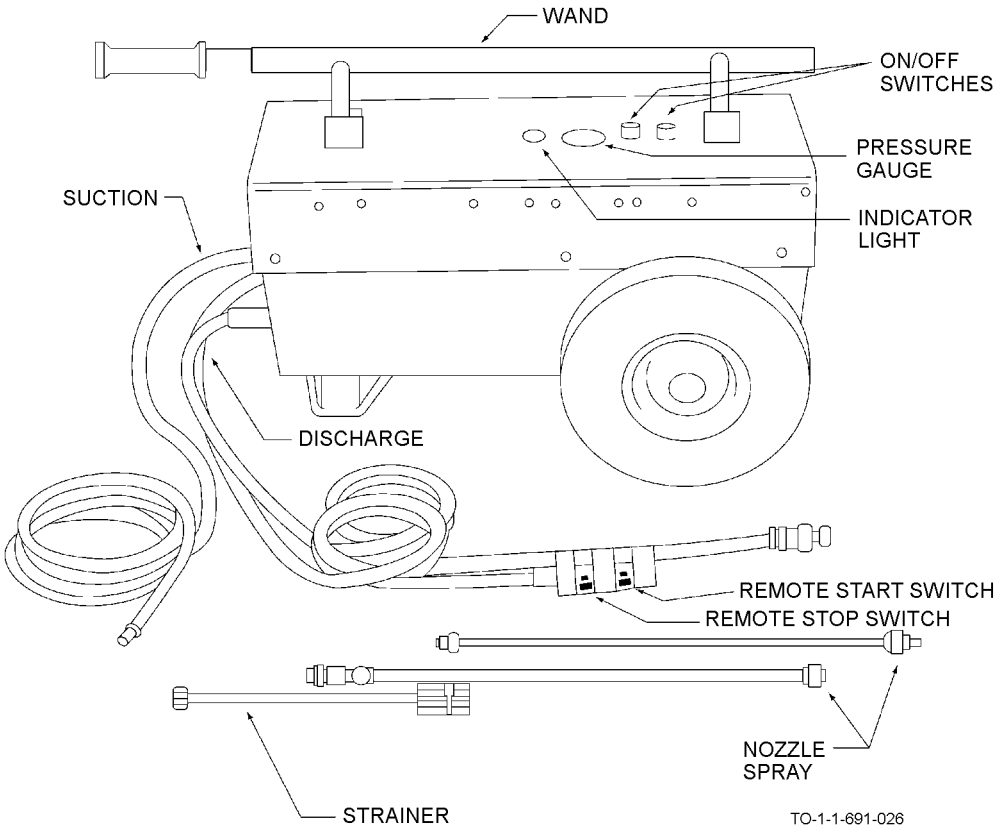


Figure 3-3. Universal Wash Unit

e. If the foam is too wet, close the cleaning compound metering valve slightly. If the foam is too dry, open the cleaning compound metering valve slightly and/or lower the air pressure slightly by adjusting the air regulator. Dry foams have a longer dwell time and prolong the cleaning operation but wet foams clean better.

f. Apply the foam to the surface and allow it to dwell for a minimum of 1 minute, but not long enough to dry on the surface, and then scrub with a cleaning kit, brush, or cloth and rinse. Refer to Table 3-2 for additional instructions.

3.4.3 Portable, 45 Gallon, Foam Generating Cleaning Unit. This cleaning unit is a simplified, portable pressure operated, foam-dispensing system. (Refer to Table 3-2). It uses available air supply for its power source without using pumps. Air is metered directly into the pressurized solution chamber which forces cleaning solution into the hose to create foam. These machines shall be operated per these instructions and the directions in the specific equipment operating manual.

WARNING

Do not service the portable 45 gallon foam generating cleaning unit without releasing the tank pressure.

CAUTION

When the cleaning task is completed, drain the tank and flush with fresh water to prevent forming an extremely concentrated solution by pouring additional cleaner into the solution remaining in the tank which could damage the equipment being cleaned.

a. Release the tank pressure prior to servicing. Close the cleaning compound metering valve and the air valve and open the air dump valve to bleed off retained air pressure.

b. Open the tank by removing the cover retaining bolts and lifting off the cover. Fill the tank with an authorized, pre-diluted cleaning solution while leaving an adequate air space at the top of the tank. Replace the cover and bolt it firmly in place.

NOTE

Refer to Table 3-2 for the proper cleaner to water mix ratio.

c. Make sure the cleaning compound metering valve and the air valve are closed. Attach an air line to the air inlet/dump valve on the side of the unit and fill the void in the tank with air until the pressure is within the range of 30 to 70 PSI as indicated at the air regulator.

d. Open the air valve and then open the cleaning compound metering valve slowly while pointing the nozzle at the surface to be cleaned. Adjust the cleaner compound metering valve until the desired foam consistency is reached.

e. If the foam is too wet, close the cleaning compound metering valve slightly and/or open the air valve slightly. If the foam is too dry, open the cleaning compound metering valve slightly and/or close the air valve slightly.

f. Apply the foam to the surface and allow it to dwell for a minimum of 1 minute, but not long enough to dry on the surface, and then scrub with a cleaning kit, brush, or cloth and rinse. Refer to Table 3-2 for additional instructions.

3.4.4 Turbine Engine Compressor Cleaning Equipment. Equipment used for cleaning aircraft turbine engines is contained in specific system specific engine TO's.

3.4.5 Miscellaneous Large Cleaning Equipment. Other equipment such as truck, trailer, or wash rack/hanger mounted spray or foam equipment may be available at many locations.

3.4.6 Spray Cleaning Guns for Solvents. These solvent spray guns have an extended nozzle/tube and require approximately 14 CFM of air at 50 PSI to siphon solvent or cleaner from container and deliver it to a surface in a non-atomized spray.

3.4.7 Pneumatic Vacuum Cleaner. This unit is a small, portable, wet/dry, air-operated vacuum cleaner for removing debris and water from aircraft. (Refer to Appendix B).

3.4.8 Universal Wash Unit. Universal wash units are used for general purpose cleaning. (Refer to Figure 3-3). They apply cleaning solutions to aircraft and/or equipment surfaces in a non-foam state at the approximate rate of 2.5 gal/min at a pressure of 30 PSI. These machines shall be operated per these instructions and the directions in the specific equipment operating manual.

WARNING

Use the universal wash unit in the horizontal position only.

a. Connect the strainer unit to the intake hose and insert it into the container of water or cleaning compound solution.

b. Connect the wand and the spray nozzle assembly to the output/discharge hose or connect the discharge quick disconnect to the aircraft wash manifold quick disconnect.

c. Press the start switch on the unit or the remote start switch and observe the pressure gauge on the unit. It should indicate an increase of pressure immediately. When the pressure reaches approximately 10 PSI, release the start switch and the unit will continue to run.

d. Point the nozzle at the aircraft or equipment surface to be cleaned and spray the surface with the cleaning solution.

e. Press the stop switch on the unit or the remote stop switch to stop the unit.

f. Allow the cleaning compound solution to dwell for several minutes, but not long enough to dry on the surface, and then scrub with a cleaning kit, brush, or cloth and rinse. Refer to Table 3-2 for additional instructions.

3.4.9 Aqueous Parts Washers. These units are automatic industrial power washers comprised of an enclosed cabinet equipped with a system of spray impingement nozzles, a cycle timer, a cleaning solution reservoir with a heater unit, a fluid pump, and an effluent reservoir with a skimmer unit for removal of oil, grease, and residues. (Refer to Figure 3-4 and Figure 3-5). These automatic washers can effectively clean aircraft, missile, and equipment components by using aqueous cleaning solutions applied at varying combinations of high temperatures and pressures for the removal of soils, oils/greases, corrosion preventive compounds, and other contaminants when authorized by the aircraft SPD and/or the missile or equipment SPM. These machines shall be operated per these instructions and the directions in the specific equipment operating manual.

3.4.9.1 Effectiveness of Cleaning in Aqueous Parts Washers.

WARNING

Materials used in and effluent generated by this cleaning process may be hazardous to personnel and the environment. Contact the local Bioenvironmental Engineer and safety office for guidance on personal protective equipment (PPE) and other health and safety precautions and waste disposal. Parts may be very hot and retain hot water and/or cleaning solution in part cavities at the end of the cleaning cycle. Handle parts with water proof and heat resistant protective gloves and drain entrapped fluids back into the parts washer.

CAUTION

- Aqueous parts washers shall not be used to clean bearings unless authorized by system specific technical data.
- Due to the maximum allowable pH of 13.5 for the MIL-PRF-29602 cleaning compounds used in these parts washers, they can attack aluminum alloy and IVD aluminum coated parts. Aircraft SPD and/or missile or equipment SPM approval is required prior to cleaning these types of parts in aqueous parts washers.
- Due to the possibility for hydrogen embrittlement and other damage, only those cleaners which have been tested, approved, and listed in the most current revision of the applicable landing gear technical order shall be used in aqueous parts washers for cleaning LG components including wheels and brakes.
- Depending on the type of equipment used, water/cleaning solution spray pressures in aqueous parts washers can range from 40 to 100 PSI. Suitable fixtures and/or baskets must be used to secure components during the cleaning cycle to prevent damage caused by impingement of the high pressure spray.

The effectiveness of cleaning in aqueous parts washers is influenced by several factors that should be considered when using this cleaning method.

3.4.9.1.1 Spray Nozzles. There are two basic nozzle designs, fan and cone spray. The distance of the parts in the cabinet from the spray nozzles determines how effective the force of the spray from the nozzles will be and the area of coverage. Placing parts too close to the spray nozzles reduces the surface coverage of the nozzles and too far from the spray nozzles reduces the force of the spray. Understanding this and racking parts properly in aqueous parts washers will improve the cleaning effectiveness of the machine.

3.4.9.1.2 Bath Quality. Maintaining the condition of the cleaning bath affects its ability to remove soils. There are two types of detergents used in aqueous cleaning, emulsifying and non-emulsifying. Emulsifying cleaners break down the oils and greases and hold them in suspension in the bath. With these cleaning materials, their cleaning ability becomes degraded by excessive amounts of oil and greases being held in the bath. It is important to monitor and change the bath solution routinely to maintain effective cleaning. The non-emulsifying cleaners break down the oils and greases but do not hold the materials in the bath solution, they rise to the top of the bath. It is important to have an effective skimmer on machines using non-emulsifying cleaners to remove the oil and greases. The proper concentration of cleaner in the bath also affects the bath performance. The heated cleaning solutions cause evaporation and proper make up of both water and cleaner should be added. This should be monitored regularly and adjustments made per the manufacturer's instructions.

3.4.9.1.3 Skimmers and Filtration. Several types of both skimmers and filtration systems are available for use with aqueous parts washers. These have a major impact on maintaining bath quality. It is recommended that both the filters and skimmers be used and that they be maintained properly per manufacturer's instructions to ensure bath quality and the cleaning effectiveness of the machine.

3.4.9.2 Determination of Capacity of the Aqueous Parts Washer. Determine the capacity of the aqueous parts washer cleaning compound reservoir and fill it with MIL-PRF-29602 or the applicable landing gear technical order approved cleaning compound solution mixed/diluted per the manufacturer's directions.

NOTE

Agitation prior to reaching the required operating temperature may cause the cleaning solution to foam excessively. Do not use the washer until the cleaning solution has stabilized at the proper temperature.

a. Allow the cleaning solution to stabilize at the temperature recommended by the manufacturer within the range of 140° to 180° F.

CAUTION

- When cleaning components which can entrap fluids, load the components in the basket so that as many cavities as possible that can entrap fluids are face down to prevent corrosion caused by fluid retention.
- Due to evaporation of the heated cleaning baths, the bath level must be monitored. This is necessary to ensure levels do not go down and expose the heating elements of the machine as this will cause them to burn out.

b. Place components to be cleaned in the aqueous parts washer and either secure them to the turntable or secure the basket in which they are placed on the turntable.

CAUTION

Do not leave parts unattended in the washer cabinet as the very hot and humid environment inside the unit can cause the parts to corrode rapidly. Remove the cleaned components from the washer as soon as possible after the cycle is complete.

c. Set the wash cycle timer for 3 to 30 minutes depending on the type of soil to be removed, the quantity of soils on the parts, and the number of parts involved and based on the manufacturer's recommendations in the equipment operating manual. Light degreasing may require only 3 minutes while heavy soils and baked on grease may require a full 30 minute cycle. Always run the aqueous parts washer for the entire programmed time cycle and then allow the cleaned components to cool for a short time before removing and handling them.

d. If the cleaned components are to be subjected to an immediate in line process such as fluorescent penetrant inspection, surface treatment and/or painting, or follow-on precision cleaning, rinse the part with fresh tap water and dry them thoroughly.

e. Apply a film of MIL-PRF-81309, Type II, MIL-L-87177, Type I, Grade B, or MIL-PRF-16173, Grade 3, followed by a film of MIL-PRF-16173, Grade 4 on bare steel parts that have been cleaned and rinsed and will be left unprotected from the environment without further processing for a period of time.

3.4.10 Miscellaneous Equipment. Accessories and consumable materials for manual cleaning operations are listed in Appendix A and Appendix B, and include the following important items.

a. The 3M Co., PN 251 aircraft washing kit (refer to Figure 3-6), is a conformable plastic device/head with a surface for attaching non-abrasive cleaning pads and sponges. It attaches to a mop handle for cleaning aircraft surface areas.

b. A-A-3100, non-metallic cleaning and scouring pads are crimped polyester fiber pads for use with detergents and solvents for cleaning aircraft, missile, and equipment surfaces. These pads can also be attached to a 3M Co., PN 251 aircraft washing kit.

c. MIL-B-23958, non-metallic bristle brushes are used to agitate MIL-PRF-87937 and MIL-PRF-85570 detergent cleaners on aircraft, missile, and equipment surfaces during cleaning operations.

d. CCC-C-440, Type I or II, Class 1 or 2 cheesecloth, CCC-C-46, Type I, Class 7 non-woven wiping cloths, A-A-59323, Type I or II low lint cleaning cloths, and SAE AMS 3819, Class 1 or 2, Grade A or B cleaning cloths are used for cleaning critical areas where an exceptionally clean cloth is required, such as solvent cleaning prior to painting, adhesive bonding, or sealing.

e. A-A-2806, or equal, plastic pump-spray bottles are used for applying diluted MIL-PRF-87937, Type I or

IV and MIL-PRF-85570, Type I or II, or concentrated MIL-PRF-87937, Type III and MIL-PRF-85570, Type V cleaning solutions to small, localized areas being cleaned.

Figure 3-4. Top Loading Type

Figure 3-5. Front Loading Type

3.5 CLEANING PROCEDURES.

Where high outdoor temperatures are encountered (80° F /27° C and above) and an indoor wash rack is not available, cleaning operations should be scheduled for early morning, late afternoon, or night. Wet aircraft exteriors with fresh water before applying cleaners to cool surfaces and help prevent fast evaporation and drying of cleaners during hot weather. For cold weather procedures, refer to Paragraph 3.5.2.6.

NOTE

Only water meeting the requirements in Paragraph 3.1.1, step g shall be used in cleaning operations (washing and rinsing) on aircraft, missiles, and equipment.

3.5.1 Warnings and Cautions. The following warnings and cautions shall be observed during aircraft cleaning operations:

3.5.1.1 Electrical.

WARNING

- Aircraft and/or other equipment shall not be washed, cleaned, or inspected on an outdoor washrack when an electrical storm is in the immediate area.
- Open all circuit breakers associated with battery power (refer to applicable aircraft manuals), prior to application of flammable solvent cleaners.
- In order to guard against the danger of static electricity, aircraft shall be electrically grounded during all cleaning operations and when moored and parked.
- Before cleaning electrical and avionic equipment, make sure electrical power is disconnected. Injury or death may otherwise result.

ACDS

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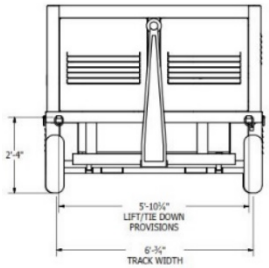
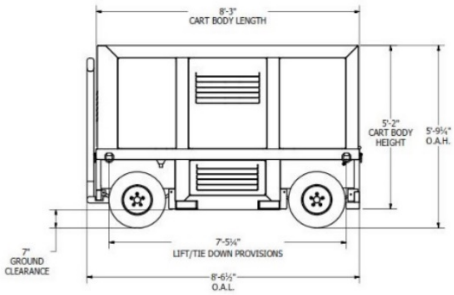
Introduction

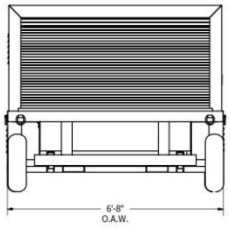
Aircraft require a high level of attention in order to achieve corrosion control, and more importantly corrosion prevention. The ability to wash aircraft continues to present itself as the opportunity to prevent corrosion and reduce the need to retroactively perform corrosion control in the future. The Riveer ACDS has been designed and manufactured for the specific purpose of capturing corrosion prevention with airframe and engine wash operations on rotary wing and small fixed wing aircraft.

The Riveer ACDS is a hydraulic powered aircraft wash cart with upgraded capabilities allowing fixed wash rack assets in a mobile solution. Two hot water (no more than 140 degree F) rinse wands provide 8 gallons per minute (GPM) each at an aircraft safe 30, 80, or 175psi. The onboard air compressor and foam system delivers a dirt busting 50+ gallons of foam per minute, matching or exceeding hard mounted foam systems. The new and improved turbine flush system allows for delivery of gas path cleaner or rinse water at 2.5gpm, 5gpm, or 10gpm – allowing the ACDS to do a turbine flush system on a variety of power plants or multi-engine aircraft.

The onboard compressor can provide up to 24 cfm at 120psi for bleed band closure and other requirements. An onboard generator includes a convenience outlet with a standard 120v outlet for additional power needs. The compact design allows internal air transport in the Chinook and larger aircraft plus the unit can be forklifted onto a trailer, train-car, shipping container, or loading dock.







Specifications

- 450-gallon fresh water holding tank
- 2" NST autofill, ¾" autofill functions
- Full cart enclosure for engine and pumps with access doors and fully removable enclosure for complete and easy access to engine, hydraulics and pumps
- 25 HP water cooled Kubota® diesel
  - Tier IV certified
  - Optima™ Red Top AGM battery
  - 30-gallon fuel tank
  - Runs on diesel or JP-8 fuels
  - Complete instrumentation
    - Low oil, high heat, hour meter, tachometer
  - Constant engine speed
- Central Hydraulic System
  - Power is transmitted to all primary functions on the ACDS from the diesel engine driven hydraulic pump.
  - All functions onboard the ACDS are driven by an individually selectable hydraulic drive motor dedicated to that output function.
  - Each hydraulic output is metered based upon power available from the diesel engine and the user demands in order to maintain optimum engine speed and functional output.
  - In order to maximize service life and efficiency, the ACDS does not contain any belt driven systems.
- Hydraulically driven Wanner Engineering® Positive Displacement Rinse/Foamer Pump with run dry capability
- Hydraulically driven Wanner Engineering® Positive Displacement Turbine Engine Flush Pump with run dry capability
- 2 independent heater coils
- 140-degree maximum wash water, regulated
- 2 rinse wands @ 8 GPM each with adjustable pattern gun, 100' of hose on a reel, 175 PSI maximum (max output of pump is 16 gpm – if both guns are in use)
- Single nozzles with adjustable pattern selection on gun for maximum cleaning efficiency
- Built-in high capacity foamer, 50 GPM foam with 75' hose and firefighter style gun
- Built-in on demand hydraulically driven cast iron 24 CFM, 120 PSI air compressor with 75'of hose on reel (operates common air tools)
- One button winterization of the entire system using air purge of all lines and fittings for freeze protection from onboard air compressor
- Autonomous Freeze Protect Mode: When armed, the ACDS will actively monitor ambient temperature within the rinse water holding tank, and system enclosure and will start engine, diesel burner and engage hydraulics without any user input to circulate water through diesel burner and holding tank to maintain temperature within the cart to avoid freezing.
- 15-gallon soap concentrate and 15-gallon gas path solution tanks
- Built-in Turbine Engine Flush, designed for C-130J, CH-47, H-58, H-60 and H-64.
- Run dry protection on pumps
- 12 volt electrical controls
- AGSE parking brake and AGSE style cart with SP® 8,000lb running gear and Ackerman style steerable front axle assembly
- Complete custom steel tube frame construction, MIL-STD 810F painted with 2-part epoxy
- 8 tie down "D" rings
- Pintle hook with 6" to 28" range can be towed by a wide variety of commonly found vehicles
- 6.90 x 9- 10 ply tires with optional foam filled configuration
- Proven air transportability
- Fully documented spares list
- Complete manuals with 3-d drawings and comprehensive bill of materials
- Easily operated with minimal training
- Powder coated enclosures and durable epoxy powder coated frame coating

MIL Standard Compliance

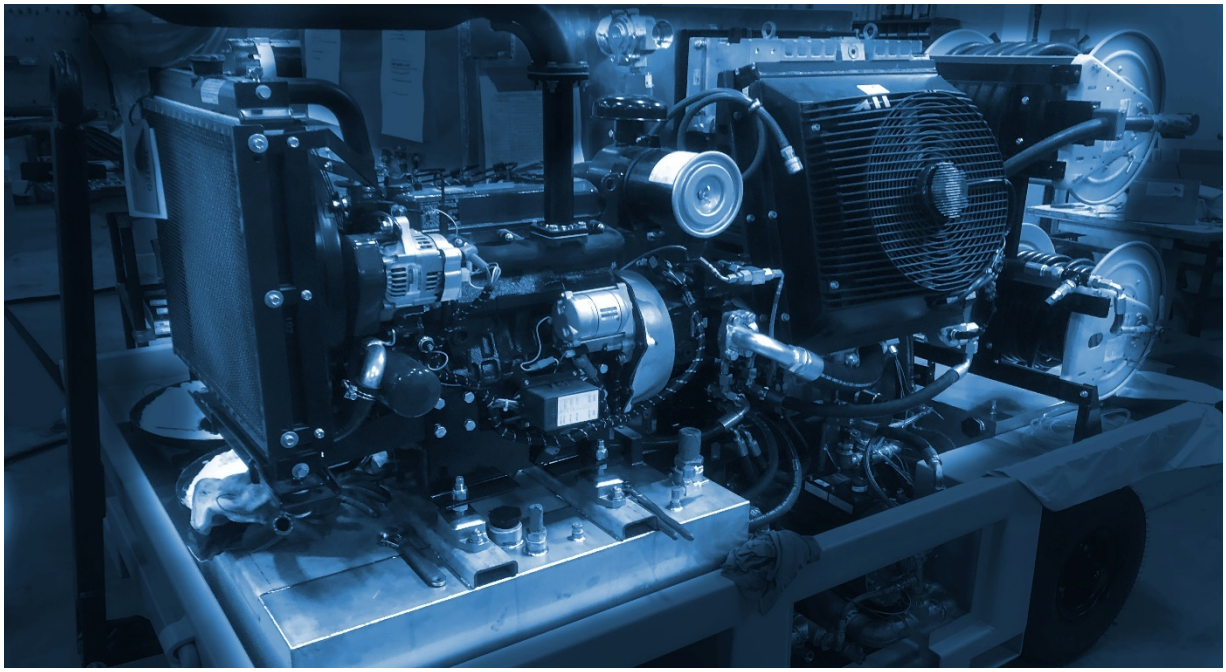
- TM 1-1500-344-23-2, TO 1-1-691, GEN MIM 2005-005
- MIL-STD-209K
- MIL-STD-461 G
- A-A-5255
- MIL-STD-810G W/ Change 1
- MIL-STD-HDBK-1791
- NFPA 70
- A-A-50271
- MIL-DTL-5624W
- MIL-DTL-83133J
- ASTM D 1655

Chassis

The ACDS is built on an AGSE style chassis with a steerable front axle and towbar in order to eliminate tongue weight and enable maneuverability by commonly found AGSE equipment. Chassis construction begins with a full MIG welded 2” x 4” steel tube frame for added rigidity over traditional steel channel construction. Throughout the fabrication process, Riveer includes 8 lift/tie-down rings, and 6 fork pockets to enable forklift access from three sides and lift and tie down access all around.

Once fabrication is complete, the chassis is media blasted and treated to a 4 stage zirconium pretreatment and an epoxy primer for proper surface preparation in order to achieve proper adhesion of the powder coat finish. Optionally the entire unit can be hot dip galvanized for maximum corrosion resistance.

Following fabrication and finishing, the frame is mated to a 4 wheel Ackerman type 8,000lb running gear setup with steerable front axle. Suspension is provided with leaf springs on all four corners and 6.90 x 9- 10 ply tires with optional foam filled configuration.



Diesel Hydraulic Propulsion

Propulsion onboard the ACDS begins with a 25 Hp Kubota Tier IV F compliant diesel engine driving a central hydraulic pump. Power is transmitted to the functional components utilizing hydraulics for greater dependability, select ability and efficiency over traditional belt drive systems. This diesel over hydraulic powerplant will provide power to all onboard systems including, the primary rinse water pump, turbine engine flush pump, 24 CFM, 120 psi onboard air compressor, and 3kW generator.

Each positive displacement pump, compressor and generator on board is powered independently for individual selection enabling flight line supply of compressed air, or electrical power without the need to run all pump systems. The ACDS' ability to disengage pump rotation and engage air compressor rotation allows the unit to self winterize itself with its own air compressor.

Controls

The control package on the ACDS is based upon a CAN bus system controlled through a single Human Machine Interface (HMI) screen located at the operational end of the cart. Engine start/stop is enabled through the HMI along with, rinse pump, hot water, foamer, electrical power generation, turbine engine flush, and compressed air engagement. Additionally, users can configure turbine engine flush parameters for flow as well as air compressor output depending upon which aircraft powerplant is being flush and how many are being addressed at once.

Rinse pump demand is monitored in real time by the onboard computer to adjust hydraulic fluid flow, hydraulic motor speed and rinse pump output in order to maintain a constant volume and pressure of rinse water per gun as users open and close spray wands.

Rinse parameters including rinse pressure, rinse temperature as well as environmental parameters such as rinse water holding tank temperature are actively monitored through the HMI. Based upon observed conditions the ACDS can autonomously execute freeze protection operations and one button winterization.

Automated Freeze Protection & Winterization

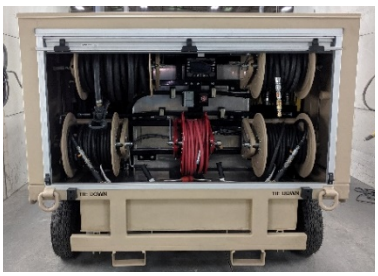
Freeze protection mode is enabled on the HMI and when the unit is left with power on. In freeze protection mode, the ACDS will constantly monitor water temperature within the enclosure and rinse water holding tank temperature. Once a threatening temperature is sensed, the diesel engine, a diesel burner and the rinse pump will engage to cycle hot water through the system until holding water temperature reaches 90 degrees F to avoid a freezing condition within the system plumbing.

One Button winterization achieves a full purge of water within the internal plumbing. As users select “winterize” on the HMI, the ACDS will engage hydraulics to run the air compressor delivering compressed air to all internal plumbing to purge water from the internal plumbing as well as the rinse hoses.

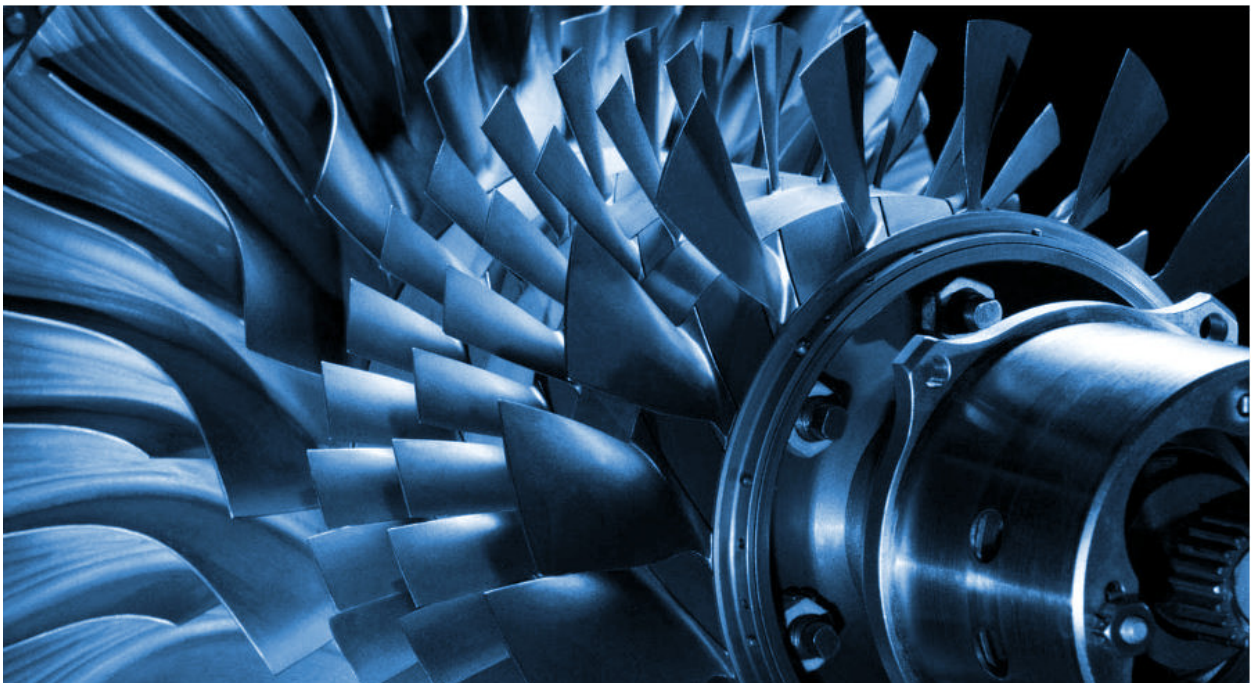
Wash & Rinse & Fluid Delivery System

The ACDS provides full wash capabilities with an onboard foam generator as well as two 8 GPM rinse guns. The foam generator begins the wash process by producing and delivering 50 GPM of soap foam to the airframe. This production and delivery rate is fast enough to cover the side of a CH-47 Chinook in under 60 seconds continuously.

Rinse operations are enabled using two hot water rinse guns delivering 8 GPM per gun at 175 psi for a total flow rate of 16 GPM for full compliance with TM 1-1500-344-23-2, TO 1-1-691, and GEN MIM 2005-005 guidelines for safe aircraft cleaning. With triple the flow rate of a traditional pressure washer, the ACDS conducts rinse operations 3 times faster.



The ACDS maintains organization with five hose reels for quick and secure stowage of the foam gun, rinse gun and compressed air lines inside the illuminated wash compartment with a quick access, roll up door. Rinse guns are connected to 100’ rinse hoses and feature an adjustable pattern gun for selection between conical “full fog” and long reach spray patterns.



Turbine Engine Flush System

The ACDS features an onboard turbine flush system which allows for selectable delivery of gas path cleaner or rinse water at 2.5gpm, 5gpm, 10gpm, 12 GPM modes within pressure selection between 20- 125 psi– allowing the ACDS to do a turbine flush system on a variety of power plants or multi-engine aircraft.

The turbine engine flush system is enabled by a hydraulically driven, independent positive displacement pump with run dry capabilities for extended service life. The hydraulically driven onboard central air compressor provides up to 24 cfm at up to 120psi for simultaneous bleed band closure of (4) bands.