20 Standard Practices – Airframe

CHAPTER 20

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
20-EFFECTIVITY	1	Nov 30/83
20-CONTENTS	1	May 12/78
20-00-00	201	Apr 18/80
	202	Nov 30/83
	203	May 12/78
	204	May 12/78
	205	May 12/78
	206	May 12/78
	207	May 12/78
	208	May 12/78

"END"

CHAPTER 20 - STANDARD PRACTICES - AIRFRAME

TABLE OF CONTENTS

"END"

STANDARD PRACTICES - AIRFRAME

TORQUE WRENCHES

When a torque wrench and adapter is used, (Figure 201) compensation must be made for the extra leverage gained. New indicator readings must be calculated before the wrench is used. To figure the desired lower readings which will actually give the torques specified, use the following formula:

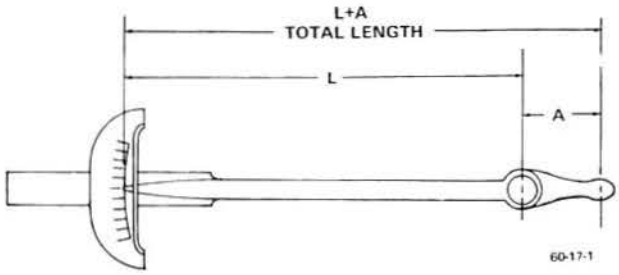
$$\frac{\text{Original wrench length} \times \text{specified torque}}{\text{length of wrench} + \text{adapter}} = \text{Desired reading}$$

Example:

	D	=	Desired reading
	L	=	Length of torque wrench
	A	=	Adapter length
	T	=	Torque

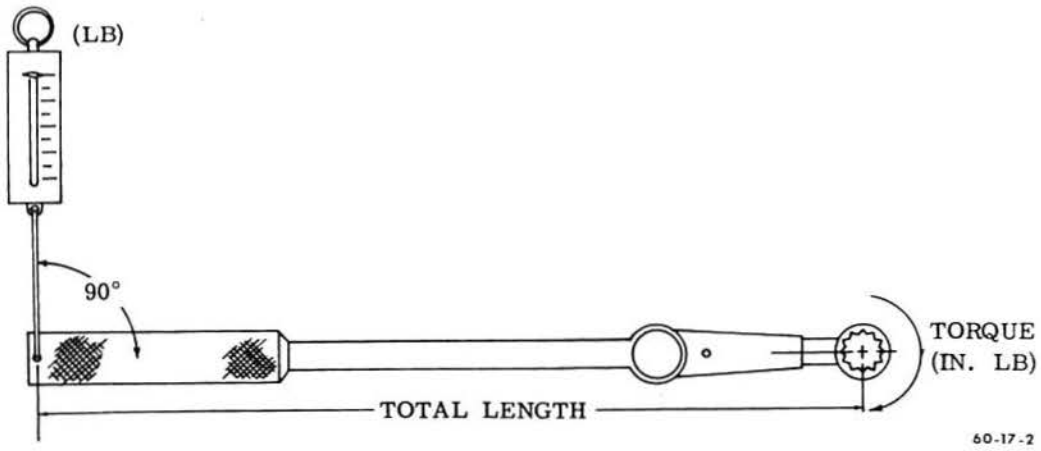
D	=	?
L	=	33 inches
A	=	11 inches
T	=	5,000 inch-pounds

$$\frac{33 \times 5{,}000}{33 + 11} = \frac{165{,}000}{44} = 3{,}750 \text{ inch-pounds}$$



Torque Wrench and Adapter
Figure 201

An acceptable method of checking the torque if a torque wrench is not available (Figure 202), is to attach a spring scale to a conventional flex or "T" handle inserted in an adapter. Force should be applied in a direction perpendicular to an imaginary line extending from the center of the bolt through the spring scale attaching point.



Computing Torque with Spring Scale
Figure 202

To calculate the force in pounds (scale reading) required to obtain the specified torque, divide the torque in inch-pounds by the distance in inches between the center of the bolt and the scale attaching point. For example, if the specified torque is 5,000 inch-pounds and the distance is 25 inches, a pull of 200 pounds must be applied. Unless torque values are specified as wet (lubricated), bolts to be torqued must be clean and free of all lubricants; otherwise loss of normal friction allowed for establishing the torque values may result in overtorquing of the bolt.

When a torque wrench adapter is used, the length of the adapter must be added to the length of the flex or "T" handle wrench and a value calculated for that particular combination. The following is a typical example in finding a desired value.

Effective length of flex or "T" handle wrench ..... 12 inches
Length of adapter ..... 3 inches
Total length ..... 15 inches
Desired torque on bolt ..... 2,000 inch-pounds

$$\frac{\text{2,000 inch-pounds}}{\text{15 inches}} = \text{133.3 pounds (scale reading)}$$

AIRPLANE FINISH CARE

CLEANING AND WAXING THE AIRPLANE FINISH

NOTE

Urethane finishes are fully cured at time of delivery, may be cleaned with detergents and require no waxing.

Enamel finishes will maintain the original beauty for many years if a few timely suggestions are followed. To preserve this finish, the following care is recommended:

DURING CURING PERIOD (90 days)

a. The airplane should be cleaned with cold or lukewarm water and a mild nondetergent soap. Any rubbing of the painted surfaces should be done gently and held to a minimum to avoid cracking of the paint film. Rinse with cold water and dry with cloths or chamois.

b. Avoid use of waxes or polish. They seal the paint from the air and delay the curing process.

c. Do not rub or buff the finish.

d. Flights through rain, hail or sleet should be avoided.

e. Avoid fluids containing dyes, such as fuel and hydraulic oil, being accidentally spilled on the painted surfaces.

AFTER CURING PERIOD

a. Always wash the airplane with a mild soap and water. Rinse thoroughly.

b. Remove oil and grease with naphtha.

c. Wax with any good grade of automobile wax in a shaded area. A heavier coating of wax on the leading edges will help to reduce abrasions in those areas. (Urethane paint requires no waxing.)

d. Never use strong detergents to clean the airplane.

NOTE

Frequently inspect the underside of the wing and flaps in the area covered by the engine turbocharger exhaust stream for fuel lead deposits. If such deposits are discovered, they should be removed immediately with a water and mild detergent solution and the surface rewaxed.

EXTERIOR AND INTERIOR FINISHES

NOTE

Any time an airplane is repainted or touched up, inspect all placards to ensure that they are not covered with paint, are legible and are securely attached.

The following list is included to be used as a reference should it become necessary to touch up or match an interior or exterior paint. Each paint is listed according to specific type and whether an exterior or interior paint.

EXTERIOR AND INTERIOR PRIMERS

Interior (Aluminum)	MIL-P-8585
Interior (Magnesium)	Enmar EX1479
Exterior (Aluminum)	Enmar EX2016G or MIL-P-8585
Exterior (Magnesium)	Enmar Epoxy Primer
Urethane Acid Etch Wash (Exterior Surface)	Enmar EX2016G Base Enmar T6070 Catalyst
Urethane Intermediate Coat (Exterior Surface)	U.S. Paint 6165 Base U.S. Paint AA-92-C-4A Catalyst

ENAMEL

(Exterior Colors)

Pacific Blue	118684-1
Morning Glory Blue	118684-3
Blueberry Blue	118684-5
Surf Green	118684-7
Shamrock Green	118684-9
Turquoise	118684-11
San Mateo Wheat	118684-13
Lemon Yellow	118684-15
Saturn Gold	118684-17
Castle Tan	118684-19
Beaver Brown	118684-21
Flamingo	118684-23
Huntsman Red	118684-25
Toreador Red	118684-27
Chianti Red	118684-29
Matterhorn White	118684-31
Black	118684-33
Champagne Gold	118684-39
Jubilee Gold	118684-221
Sable Brown	118684-223
Sunshine Yellow	118684-231
Capri Blue	118684-265
Omaha Orange	118684-273
Kingston Gray	118684-299
Peacock Turquoise	118684-333
Terrace Blue	118684-335
Sahara Tan	118684-337
Prairie Beige	118684-339
Antique Gold	118684-341
Beachwood	118684-345
Embassy Red	118684-347
Marlin Blue	118684-349
Bahama Blue	118684-351
Pavonne Blue	118684-353
Matador Red	118684-355
Sunburst Yellow	118684-357
Jade Mist Green	118684-359
Astro Blue	118684-361

URETHANE

(Exterior Colors)

Jubilee Gold	118684-302
Morning Glory Blue	118684-304
Blueberry Blue	118684-305
Surf Green	118684-306
Shamrock Green	118684-307
Turquoise	118684-308
Lemon Yellow	118684-310
Castle Tan	118684-312
Huntsman Red	118684-315
Toreador Red	118684-316
Chianti Red	118684-317
Matterhorn White	118684-318
Black	118684-319
Sable Brown	118684-320
Capri Blue	118684-322
Champagne Gold	118684-323
Omaha Orange	118684-324
Kingston Gray	118684-325
Marlin Blue	118684-393
Bahama Blue	118684-395
Pavonne Blue	118684-397
Matador Red	118684-399
Sunburst Yellow	118684-401
Jade Mist Green	118684-403
Astro Blue	118684-405
Peacock Turquoise	118684-407
Terrace Blue	118684-409
Sahara Tan	118684-411
Prairie Beige	118684-413
Antique Gold	118684-415
Beechwood	118684-419
Embassy Red	118684-421

LACQUER

(Interior Colors)

Alpine Blue	118684-63
Anchor Gray	118684-75
Dull Black	118684-133
Autumn Smoke	118684-155
Desert Beige	118684-181
Driftwood	118684-183
Artic Beige	118684-235
Sandusky (Gold)	118684-237
Frontier (Gold)	118684-239
Banff Blue	118684-241
Sable Brown	118684-257
Turquoise	118684-275
Mist Green	118684-277
Pumpkin	118684-279
Broadway Blue	118684-283
Sun Beige	118684-285
Torch Red	118684-329
Spanish Gold	118684-423
Canyon Blue	118684-427
Gulf Blue	118684-429
Maize Gold	118684-455
Silver Gray	118684-457
Green	118684-461
New Blue	118684-471
New Bronze	118684-475
Varsity Blue	119694-477

ENAMEL

(Interior Colors)

Insignia Red	94-509
Black	94-515
Instrument Black	Color No. 514 per ANA Bulletin No. 157

Short cut masking jobs for your paint department are possible when you use pre-cut paint patterns and numbers. Stripe and numeral patterns are available from Mid-America Marking Inc., 1720 S. 151 W., Wichita, Kansas 67052, or any other equivalent product may be used. Current listings include 4, 12, and 20 inch Call Numbers and Letters. Time can be saved when using these patterns and a much neater final paint job can be expected.

PAINTING ALUMINUM

ENAMEL PAINT

PREPARATION OF AIRPLANE ALUMINUM EXTERIOR FOR PAINT

a. Mask windows with a double thickness of paper. Cover all openings where paint might enter airplane.

b. Sand scratches and rough areas to improve smoothness.

c. Clean surface of airplane with solvent, (lacquer thinner or methyl ethyl ketone), to remove shop primer, exposed sealer, and other shop soils.

d. Lightly roughen all scratches with nylon pad to insure a satisfactory paint base.

e. Reclean the roughened surface with solvents to ensure removal of all hand prints and dirt.

APPLICATION OF EXTERIOR PAINT ON ALUMINUM SKINS

a. Prime surfaces with wash primer (25, Chart 207, 91-00-00). Mix only enough primer for use within an eight hour priod. Primer mixed longer than eight hours must be discarded.

b. Apply one coat of wash primer. Keep air pressure at a minimum to prevent overspray.

NOTE

Temperature and humidity will effect drying time of the primer. It should dry at least 15 minutes before recoating the surface (test surface with light fingernail pressure).

c. Proceed to prime with a wet coat of MIL-P-8585 zinc chromate primer (26, Chart 207, 91-00-00) thinned one part primer and two parts toluol. A heavy hiding coat of this primer is not desired and will impair performance.

d. The exterior surfaces are now ready for color coat.

e. Spray on two thin topcoats of enamel.

EXTERIOR PAINT TOUCH-UP REPAIR (ENAMEL)

a. Mask around the skin containing the damaged area.

b. Remove any loose edges of paint by using a high tack adhesive tape around the edge of the damaged area.

c. Using a coarse sandpaper, fair the edge of the damaged area with the metal.

d. When the edge of the paint begins to "feather" into a smooth joint, use a fine grade of sandpaper to eliminate the sand scratches left by the coarse paper so that the finish will be perfectly smooth. Take care to avoid removing any more metal then is absolutely necessary.

e. Wash the sanded area with a solvent, such as naphtha or toluol. Change the wash cloths used for this purpose frequently so that all the sanding dust will be picked up.

f. After the area to be touched up has been cleaned with solvent until all trace of discoloration is gone, apply a thin coat of pretreatment primer to the damaged area.

g. Spray two or three coats of the zinc chromate primer for a heavier than normal build-up.

h. After the primer has dried, sand the area being repaired with a medium fine sandpaper. Sand the edge of the repair area until the indentation where the metal and the old paint meet is gone. If it is necessary, apply additional primer until the junction of the paint and metal is no longer visible.

i. Spray on two thin topcoats of finish paint.

URETHANE PAINT

The need for an extremely hard finish for protection against sandblast during takeoff and landings led to the development of urethane coatings for airplanes. Urethane paint dries into a high gloss and retains color much better than standard finishes. It is unaffected by the chemicals in hydraulic fluids, deicer fluids and fuels and requires less care and maintenance than other finishes.

URETHANE PAINT REPAIR PROCEDURES

NOTE

The time normally required for urethane paint to cure must be extended at temperatures below 70°F. The paint will not cure at temperatures below 60°F.

Dukes painted with urethane paints are finished with pretreatment (wash) primer, urethane primer and a topcoat of urethane enamel. The following procedures include cleaning, paint stripping, repaint preparation, priming, applying a urethane topcoat and an alternate method for small repairs not requiring paint stripping. Careful observation of these procedures should result in a smooth, hard, glossy finish with firm adhesion for maximum life.

STRIPPING AND CLEANING URETHANE PAINT

Because of their resistance to chemicals and solvents, urethane paints and primers require a special paint stripper. If a urethane stripper is not available, a good enamel stripper may be used. Removing the finish with such a substitute will require several applications while working the stripper in with a stiff brush or wooden scraper.

a. Mask around the edge of the skin or skins containing the damaged area. Use a double thickness of heavy paper to prevent accidental splashes of paint stripper from penetrating the masking.

b. Apply urethane stripper as indicated by the manufacturer's direction. Try to stay approximately 1/8 inch away from the masking tape. This will necessitate a little more cleanup upon finishing, but will prevent damage to the finish on the next skin. The stripper will not attack aluminum during the stripping process and can be neutralized afterwards by rinsing the affected area with water.

CAUTION

Urethane strippers usually contain acids that irritate or burn the skin. Wear rubber gloves and eye protection when using the stripper.

c. Rinse the area with water and dry.

d. Wash the stripped area carefully with a solvent such as methyl ethyl ketone or lacquer thinner. This will prevent tiny particles of loose paint from adhering to the stripped area.

e. Using a nylon scratch pad or aluminum wool dipped in water, clean the surface with a cleanser such as Bon Ami, Ajax, Comet cleaner, etc. A good scouring will leave the surface completely clean.

f. Thoroughly rinse with clean water and carefully dry the affected area. If the stripped area includes several joints or skin laps, let the airplane sit until all moisture has dried. This may be accelerated by blowing the skin laps and seams with compressed air. Wet masking should be replaced.

PRETREATMENT (WASH) PRIMER FOR URETHANE PAINT

An acid etching primer that conforms to MIL-C-8514 should be applied to improve adhesion of the finishing coats. EX2016G base and T6070 catalyst (products of Enmar Paint Company, Wichita, Kansas) are used in equal parts as a pretreatment wash primer at the factory.

a. Mix the primer in accordance with the manufacturers instructions.

b. Apply a thin coat of primer. It should be permitted to dry for at least an hour, but not over six hours, before the next coat of urethane paint is applied.

URETHANE PRIMER

a. Mix two parts of the 6165 primer base to one part AA-92-C-4A catalyst (products of U.S. Paint Company, Wichita, Kansas) for intermediate primer.

NOTE

For the best results, these directions must be followed carefully; for some manufacturers require that the primer be allowed to set for 1/2 hour after the catalyst and base have been mixed while others recommend immediate use after mixing.

b. Apply a coat of urethane primer with a spray gun using 35 to 40 psi of air pressure. A dappled appearance indicates that the coat is thin.

c. The primer should be permitted to dry approximately two hours at a temperature of 85° to 90°F at low humidity. When the primer can not be scratched with a fingernail or will not ballup with sandpapering it is ready for the topcoat application.

d. If the initial primer coat is allowed to cure for more than 24 hours before the topcoat is applied, sand the primer coat slightly to roughen the surface and ensure adhesion. Wipe off the sanding dust with a cloth dampened with a solvent (such as lacquer thinner), then apply the topcoat.

URETHANE TOPCOAT APPLICATION

a. Mix the paint and catalyst as directed by the manufacturer.

b. Apply the topcoat with a spray gun at 35 to 45 psi of air pressure. Two coats are normally required to fully conceal the primer and build up the topcoat film for adequate service life and beauty. The urethane finish will normally cure to 85% of its full hardness in 24 hours at temperatures of 80°F or higher.

URETHANE TOUCH-UP REPAIR

a. Mask around the skin containing the damaged area.

b. Remove all loose edges of paint by using a high tack adhesive tape around the edge of the damaged area.

c. Using a coarse sandpaper, fair the edge of the damaged area.

d. When the edge of the paint begins to fair into a smooth joint, use a fine grade of sandpaper to eliminate the scratches left by the coarse paper. Take care to avoid removing any more metal than is absolutely necessary.

e. Wash the sanded area with a solvent, such as lacquer thinner or toluene. (Do not use methyl ethyl ketone as it will soften urethane paint.) Change the wash cloths used for this purpose often so that all the sanding dirt will be picked up.

f. After the area to be touched up has been cleaned with solvent until all traces of discoloration are gone, apply a thin coat of pretreatment primer to the damaged area.

NOTE

If a metal conversion coating such as iridite or alodine is used, the wash primer coating can be dispensed with. If the metal has not been treated with a metal conversion coating and no wash primer is available, carefully clean the surface to be touched up and apply urethane primer to the bare metal. This should produce a satisfactory undercoat for the repair area.

g. After the urethane primer has cured for 24 hours, sand the area under repair with medium fine sandpaper. Sand the edge of the repair area until the indentation where the metal and old paint meet is gone. If necessary, apply additional urethane primer until the juncture of old paint and metal is no longer visible.

h. Spray on two topcoats.

PAINTING MAGNESIUM

PAINT REMOVAL FROM MAGNESIUM SURFACES

a. Mask around the edge of the damaged area with a double thickness of heavy paper to prevent accidental splashes of paint stripper from penetrating the masking.

b. Apply paint stripper (42, Chart 207, 91-00-00) to the skin under repair with a brush or non-atomizing gun.

CAUTION

Stripping should be accomplished in a well ventilated area since prolonged exposure to high concentrates of vapor may irritate the eyes and lungs.

c. Allow the paint stripper to work for 20 to 30 minutes, then work the remaining paint loose with a bristle brush.

CAUTION

Never use a wire brush for it will damage the magnesium surface.

d. Remove the masking paper and wash the affected area thoroughly with water under high pressure. Remove all remanents of paint with lacquer thinner.

e. Sand the repaired area lightly, then apply Dow No. 19 to aid in the prevention of corrosion.

PAINTING MAGNESIUM SURFACES

a. Prepare the surface to be repainted as indicated under PAINT REMOVAL FROM MAGNESIUM SURFACES. Clean the affected area thoroughly with lacquer thinner or an equivalent solvent.

NOTE

Unprimed areas of magnesium castings are to be coated with MIL-C-16173 corrosion preventative compound (43, Chart 207, 91-00-00) unless these areas will come into contact with oil or grease after assembly. Any holes in the castings which will receive bushings or bearings shall be coated with wet unreduced zinc chromate primer or corrosive preventative compound at the time of installation.

b. Prime the affected area and apply either the enamel or urethane topcoat if applicable.

NOTE

Do not apply wash primer to magnesium surfaces. Allow a minimum of four hours drying time between application of the primer and top coat.

SPECIAL PAINT PROCEDURES

PROPELLER BLADES

Paint the backs of the propeller blades with quick drying enamel per MIL-E-5556, color No. 37038 per Federal Standard 595.

LANDING LIGHTS

Paint the landing light wells, excluding the ribs at the inboard and outboard ends, the spar and attaching angles, with quick drying enamel per MIL-E-5556, color No. 37038 per Federal Standard 595.

AIR CONDITIONER EVAPORATOR COMPARTMENT

Apply epoxy primer (24, Chart 207, 91-00-00) to the entire surface area of the parts which make up the compartment.

NOSE RADOME

Sanding surfacer or filler may be used to obtain a smooth surface. Sand with 180 sandpaper just enough to remove the glaze. After sanding, the radome contour shall be free of pits, holes or irregularities which may reduce radar transmissivity and range. If glass laminate fibers are exposed, a hot resin wipe should be applied to seal the laminate and followed with a light sanding with No. 400 sandpaper to remove the glaze. Do not repair with Devcon, body putty or any other plastics which have a different expansion coefficient than the original resin. Apply three thin cross-coats of white elastromeric polyurethane (product of Hughson Chemical Co. Erie, Penn.) consisting of CD 857-40A (two parts by volume) and CD 857-40B (one part by volume) to the forward 15 to 17 inches of the nose cone. The accelerator and base are available in the kit form (P/N CD857-40 1-1/2 pint) through the BEECHCRAFT Dealer Organization. Allow one hour drying time between coats and 48 hours drying time before application of urethane topcoat.

SURFACES SUSCEPTIBLE TO MUD AND SPRAY

Apply one coat of white epoxy paint to the following areas:

1. Main and nose landing gear wheel wells.
2. Interior surface of landing gear doors.
3. Main and nose landing gear assemblies.

RUBBER SEALS

Apply one coat of a thoroughly dissolved solution of one part Oakite No. 6 and two parts water to all rubber surfaces that are to come into contact with metal or other rubber surfaces. Apply a thin coat of Dow Corning No. 7 after the finish top coat is dry.

ENCLOSED AREAS SUBJECT TO HIGH HUMIDITY

Steel, aluminum or magnesium parts and assemblies which are enclosed and subject to high humidity should be protected against corrosion by coating with either epoxy primer, MIL-C-16173 corrosion preventative compound, light grease or heavy oil.

LOWER WING AND FLAP SKINS

If inspection of the lower wing and flap area aft of the exhaust stacks disclose corrosion from fuel lead deposits, remove with a mild soap and water solution. Use a stainless steel wire brush to remove deeper, more resistive corrosion. If corrosion is so deep that 15% or more of the skin thickness is removed, the surface should be replaced. If skin thickness has been reduced by less than 15% (after the corrosion has been removed), the area should be treated with cleaner (41, Chart 207, 91-00-00) or an equivalent corrosion removing compound conforming to MIL-C-38334. The skin should be treated both externally and (where accessible) internally and given a protective coating as described below, then primed and painted. Inspection door nut plates should be removed prior to treating the skins with corrosion removing compound. If corroded, the nut plates should be replaced.

CAUTION

The corrosion removing compound should be applied in accordance with the manufacturers instructions and cautions.

In addition to the above noted treated skins, new flaps and new skin splices should be treated externally with a protective coating, as described below, primed and painted, and all accessible interior aluminum wing parts on the lower side of the wing, between wing stations 66.00 and 108.281 and aft of the second stringer aft of the front wing spar, should be given a protective coating, as described, and then primed with zinc chromate.

a. Mix Alodine 1200 or 1200S (a product of Amchem Products, Inc., Ambler, Pennsylvania) with water in a ratio of 3 to 4 ounces per gallon of water.

b. Place in a plastic container and allow to dissolve at least one hour.

c. Add 10 milliliters nitric acid per gallon of solution.

d. Prepare the surface by wiping with Stoddard Solvent or methyl ethyl ketone, then scrubbing with a nylon abrasive pad to remove oxide films. Rinse with water and

repeat the above procedure until water will not bead on the surface.

e. After cleaning, immediately treat the surface, using a cheesecloth pad, cellulose sponge, or nylon brush to apply the solution with light pressure and continuous, even motion. On curved or inclined surfaces, begin application at the lower edge of the work to minimize streaking. Keep the surface wet with the solution for 1 to 3 minutes so that a continuous film is obtained, with neither a grayish appearance nor a dark, powdery, non-adherent coating. Generally, a light coating, rather than a heavier coating is preferable for a paint base, especially for epoxy primers. Streaks from brushing, or rundown of excess solution are allowable, as are slight chromic acid stains.

f. Remove excess solution with cold running water or a cheesecloth pad wetted with clean water. Never use a high pressure hose rinse, since the freshly formed chemical film will be removed or damaged. All treated parts should be kept clean before priming and painting, which should follow the chemical film application as soon as practical.

"END"