MAINTENANCE ENGINEERING ORDER

(AMCOM Reg 750-2)

MEO NO. A1116D	
DATE JULY 24, 2008	PAGE 1 of 23

TITLE

General Specification for Removing Organic Coatings from Army Aircraft using Plastic Media Blasting (PMB)

TOLERANCES

Unless otherwise noted, dimensions are in inches and Tolerances are:

Fractional.....+/- 1/32
Decimal .....+/- .010
Angular .....+/- 1/2 degrees

APPLICABILITY

Corpus Christi Army Depot

CSI Critical Characteristic — YES ☒ NO

DOCUMENT(S) AFFECTED	REFERENCES FOR RDECOM USE ONLY	DATE
	AGENX PCA	
	AED A1116C, Change 1	28 Jun 2000
	MIL-P-85891A, Amendment 2	26 June 1998
DOCUMENT CHANGE IS NOT REQUIRED		

PURPOSE OR PROBLEM

Re-write of previous AED A1116C as an MEO, including incorporation of change 1. Added the option to use starch graft acrylic polymer blast media (MIL-P-85891A, Type VII). Added application for removal of MIL-DTL-53039 and MIL-DTL-64159 CARC topcoat (in addition to MIL-C-46168) from metal and composite airframe parts.

PROJECT ENGINEER	ENGINEERING REVIEW	ENGINEERING RELEASE
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1.0 SCOPE

1.1 Application.

a. This section provides the requirements and procedures for removing organic coatings (paints, primers, or lacquers) and MIL-C-46168, MIL-DTL-53039, and MIL-DTL-64159 CARC topcoats from Army airframe structures and structural components using the plastic media blast method.

b. The plastic media blasting (PMB) procedures cited in this specification apply to open, non-automated blasting only.

c. For purposes of this specification, the plastic media blast method shall be used on metal and the following composite surfaces only: fiberglass (honeycomb and laminated), carbon fiber, boron and graphite epoxy, and Kevlar.

1.2 Limitations: The plastic media blasting procedures cited in this specification for the removal of organic coatings from structure are satisfactory except for the following materials:

a. Engineered plastics with design requirements that specify that they must remain transparent or translucent.

b. Substrates from which airborne concentrations are extremely limited for worker health reasons (example: Cadmium in most localities)

1.3 Classification : The plastic media used in this procedure shall conform with Military Specification MIL-P-85891A, Amendment 2, Type V or Type VII.

1.3.1 Type V Acrylic. See MIL-P-85891A, paragraph 1.2.1.

a. Color. Color No. 5, white to light grey

b. Part Number. See MIL-P-85891A, paragraph 6.7.

1.3.2 Type VII Starch-g-acrylic. See MIL-P-85891A, Amendment 2

a. Color. Color No. 7, off white.

b. Part Number. See MIL-P-85891A, Amendment 2, paragraph 6.7. Manufactured by Archer Daniels Midland, eStrip GPX 20/50, code 1695.

2.0 APPLICABLE DOCUMENTS

2.1 Government Documents.

2.1.1. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise stated, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation. In the event of conflict between this specification and other documents, this specification shall take precedence.

Specifications:

Federal.

QQ-A-250/4 - Aluminum Alloy, 2024, Plate and Sheet
QQ-A-250/2 - Aluminum Alloy, 7075, Plate and Sheet

Military.

MIL-C-5541 - Chemical Conversion Coatings on Aluminum Alloys
MIL-PRF-23377 - Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistance
MIL-C-43616 - Aircraft Surface Cleaning Compound
MIL-DTL-81706 - Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
MIL-DTL-85285 - Coating Urethane, Aliphatic Isocyanate
MIL-P-85891A, Amendment 2 - Plastic Media for Removal of Organic Coatings
MIL-C-87936 - Cleaning Compounds, Aircraft Exterior Surfaces, Water Dilutable

Standards:

Military (adopted).

SAE AMS-S-13165 - Shot Peening of Metal Parts
SAE AMS 1604B - Corrosion Removing Compound

Other Government Documents:

T.O. 111 - Application of Organic Coatings, Aerospace Equipment
TM 55-1500-344-23 - Weapons Systems Cleaning, Corrosion Prevention and Control
TM 55-1500-345-23 - Painting and Marking of Army Aircraft

Other Publications:

Boeing Process Specification D6-54705 dated 14 November 88 - Plastic Media Abrasive Stripping of Organic Finishes

Bell Process Specification 4357, REV F, dated 19 December 85 - Removal of Organic Finishes

Petroleum Helicopter Information Letter dated 05 July 89 - Media Blasting

Compressed Gas Association Commodity Specification G-7.1-1966

National Electric Code for Class II, Division I Locations

3.0 MATERIAL REQUIREMENTS

3.1 Source of Media Stock. The finished product shall be made from acrylic plastic or a starch graft acrylic polymer in accordance with the requirements stated for, respectively, Type V or VII plastic media in MIL-P-85891A, Amendment 2 from stock made specifically for the production of blasting media. An infrared spectrogram of the finished product shall be identical to that depicted in MIL-P-85891A, Amendment 2, Figures 5 or 7 when analyzed as specified in paragraph 4.5.2 of MIL-P-85891A, Amendment 2.

3.2 Hardness of Media Stock. The Barcol or Shore D hardness of the plastic stock prior to crushing shall be within the limits depicted in paragraph 3.2.1. of MIL-P-85891A, Amendment 2.

3.3 Physical and Chemical. The physical and chemical properties of Type V or Type VII (starch graft acrylic polymer) media shall be in accordance with (IAW) Table I of MIL-P-85891A, Amendment 2.

3.4 Particle Size Distribution. The particle size distribution of the Type V acrylic media shall normally be 20 to 30 mesh with the same particle size distribution shown in Appendix A, paragraph A.2b(3). If the stripping rate from Appendix A, paragraph A.3c(2) cannot be met , an addition of 16 to 20 mesh media is authorized, as long as a maximum arc height of less than 10 mils as shown in Appendix A, paragraph A.2b(3) is maintained. Type VII starch graft acrylic polymer media shall be per Table II of MIL-P-85891A, Amendment 2 for 20-50 mesh (U.S. Standard Screen Size).

4.0 EQUIPMENT REQUIREMENTS

4.1 General

a. The PMB equipment used to remove organic coatings from aircraft structures and component surfaces shall be a direct pressure feed abrasive blasting unit capable of propelling a controlled and continuous stream of plastic media. This equipment also requires indicators and regulation devices.

b. Nozzle: ½ inch double venturi nozzle or a flat nozzle suitable for lower aggression removal of media, such as the FanBlast Model FBN-6 (1.6 wide coating removal path) or -8 (2.2-inch wide coating removal path) manufactured by Pauli Systems.

c. Siphon fed abrasive blasting equipment shall not be used .

d. PMB equipment shall have a classification system (i.e. cyclone separator, vibratory screening system, dust bags, or water filters for removing foreign particles such as paint chips, dust, sand, metallic particles, etc. produced by the blasting operation). A cabinet or walk-in type facility may be utilized.

e. PMB equipment shall be capable of maintaining acceptable levels of media size and cleanliness IAW Section 6.1.1. and Table II of MIL-P- 85891A, Amendment 2.

f. PMB equipment shall be designed with a recovery system consisting of the following:

(1) Cyclone Separator (shaker-type) : Separates light dust from plastic media (Sweco Vibro Engineered Separator or similar)

(2) Rotary Airlock: Passes heavier plastic media through rotary vanes into the magnetic separator.

(3) Magnetic Floor Panels

(4) Double Magnetic Separator: Separates and removes ferrous material impurities from the plastic media.

(5) Screen Separator: Vibrating screen separates small undersized media from heavier media by passing the smaller size media through a screen into a waste container. Heavier media falls into a storage hopper for reuse.

(6) Double chamber pressure pot shall be utilized to maintain required media flow rate (See Tables I and II) .

4.2 Operator Equipment. Operator safety equipment is required and shall include intercommunication devices, respiratory protection equipment, blast hood, and hearing protection. The operator equipment consists of the following:

a. Breathing Air: Use NIOSH/MSHA approved respiratory protection in compliance with OSHA regulations (i.e. 1910.134 et. al.). The system shall include, as a minimum, all breathing air purification equipment necessary to provide Class D breathing air as described in the Compressed Gas Association Commodity Specification G-7.1-1966. If a compressor is used to supply the air, it shall either be a breathing air compressor or a compressor equipped with both, a carbon monoxide and high temperature alarm.

(1) A breathing air filter shall be provided to remove particulates, moisture, and oil vapor. (Chemco Industries Model CPF-80 or equivalent)

(2) A carbon monoxide monitor shall be provided. (Dynamation, Inc. Model ABL-50 or equivalent)

b. Voice Communication: Radio headset.

c. Hearing Protection: As required for operator safety (See paragraph 4.2k).

d. Blast Suit: "Apollo" helmet with leather front, and suit and gloves. (Clemco Industries or equivalent)

4.3 Equipment Maintenance.

a. PMB equipment shall be operated and maintained in accordance with the equipment manufacturer instruction manual.

b. The blasting nozzle and plastic media transport hoses shall be visually inspected for excessive wear. Replace these items as required prior to each use.

5.0 **FACILITY REQUIREMENTS**

5.1 Utilities: The PMB facility shall meet the requirements of OSHA 29CFR1910.9.

a. Ventilation. A minimum cross-draft ventilation rate of 75 cubic feet per minute per square foot (cu ft/min/sq ft) of open face area shall be provided.

b. Dust Collector. The dust collection system shall be capable of removing 99.97% of the particles 0.3 (three tenths) micron (or greater) in size from recirculation systems.

c. Dust Monitor. The dust monitor equipment shall be capable of continuously monitoring for explosive conditions of the air in the PMB facility.

WARNING

Plastic media dust accumulation in a confined area may produce explosive conditions (See Paragraph 6.6.1, MIL-P-85891A, Amendment 2).

d. Lighting. A minimum of 55 foot candles (55 lumens/sq.ft.) of illumination at the working surface is required. Portable lighting shall be provided as required to prevent shadows on the sides and bottom of the work piece. All lighting shall meet requirements of the National Electric Code for Class II, Division I locations (dust ignition proof). Reference Army Regulation 11-27.

e. Compressed Air. Compressed air shall have a maximum relative humidity of 60% at 70 degrees Fahrenheit. Air shall be filtered to remove moisture, oil, and solid particles.

NOTE

Moisture or oil in compressed air will cause the media to clump, clogging the metering valve and producing erratic performance.

5.2 Safety Requirements.

a. A flashing safety warning light shall illuminate during PMB operation and shall be located outside all PMB room doors.

b. All doors shall be designed to open outward.

c. All electrical equipment; i.e. motors, lighting and outlets, shall meet the requirements of the National Electrical Code Class II for the areas in which they are located.

d. Utilities associated with installation shall meet the requirements identified in Article 512 of the National Electrical Code.

e. Static straps/grounding cords and grounding points are required in the PMB facility as per individual aircraft technical manuals.

CAUTION
Sensitive electronic and avionic equipment must be properly grounded to preclude electrostatic discharge (ESD) damage.

f. A closed-head, wet/dry automatic sprinkler system that complies with OSHA 1910.159 and NFPA 13, Vol. I is required in each room and enclosure.

g. Operators shall periodically sweep the PMB room walls to prevent dust accumulation.

h. Integrated emergency lighting is required in the facility to illuminate exits in case of a power failure.

i. Illuminated exit signs are required inside the facility.

j. A digital dust concentration monitoring system for the PMB room is required. The air flow should be continuously monitored to ensure that the airborne concentration does not exceed 15% of the minimum explosive dust level inside the PMB room. See Section 6.6 of MIL-P-85891A, Amendment 2.

k. The PMB operations shall have protection from noise levels exceeding 85 decibels measured on the "A" weighting scale. Reference TB MED 501.

l. The noise level outside the PMB room shall not exceed 85 decibels measured on the "A" weighting scale at a radius of 10 feet from the PMB equipment and enclosure. Reading shall be taken from a height of five feet above the floor (ear level). Reference OSHA 29CFR1910.95.

6.0 TRAINING REQUIREMENTS

6.1 Personnel performing and supervising the PMB removal of organic coatings (top coat) from aircraft and component parts shall complete a three-phase training program leading to certification.

6.2 Training sources are identified by AMCOM Readiness Directorate, New Equipment Training Division, in accordance with established criteria. Contact the contracting officer for information pursuant to this subject.

6.3 Phase I shall consist of lectures and demonstrations with sufficient examinations given to assess the candidate's comprehension of the subject matter. Training shall include, but not be limited to, the following topics:

a. A general knowledge of abrasive stripping theory with plastic media and media characteristics.

b. A general knowledge of the facility and media cleanliness requirements cited in this specification and an understanding of their importance.

c. A thorough understanding of the contents of this specification as they relate to PMB parameters and applicable substrates.

d. A specific knowledge of the aircraft surfaces, parts, and coating systems to be removed.

e. A specific knowledge of masking techniques and materials required to prevent media intrusions into the aircraft/component interior during media blasting operations.

f. A specific knowledge of pre-operation cleaning and inspection requirements.

g. Knowledge of personal protective equipment use and maintenance.

6.4 Phase II shall consist of actual PMB equipment use on test panels and scrap aircraft parts to remove their organic coatings. Phase I and II will be approximately eight (8) hours.

6.5 Phase III shall consist of practical exercise for at least 32 hours. During the exercise, the new operator(s) will be supervised by previously certified personnel or instructors during PMB of production aircraft and components/parts.

7.0 MECHANICAL REMOVAL OF ORGANIC COATING SYSTEMS

7.1 Plastic Media Blasting.

7.1.1 Sampling of Plastic Media before Blasting Operations.

a. Media Contamination:

(1) Heavy particulate contamination of media shall be 200 parts per million or less (Table I, MIL-P-85891A, Amendment 2) as higher levels can cause structural fatigue.

(2) New and existing media is to be tested as a first article and as required thereafter as per paragraph 4.5 of MIL-P-85891A, Amendment 2, in order to assure that maximum levels of contamination are not exceeded. Media found to have an unacceptable level of contamination shall be purged from the system and replaced with new media.

CAUTION

PMB with heavily contaminated media may permanently damage substrate surfaces.

7.1.2 Preparation of Aircraft for PMB method.

a. Cleaning and Masking.

(1) Remove, open or protect all cowlings, doors, power train components (engines, transmissions, gearboxes, etc.), avionics components, fuel and oil lines and fuel cells per aircraft specific requirements.

(2) Clean aircraft/component surfaces to be depainted to remove oils, greases and dirt per TM 1-1500-344-23 guidelines.

(3) Mask aircraft door openings using Anchor Continental BT-100 or equivalent (item 4, Appendix B); seal door areas using 3M Gray Duct Tape No. 393 (item 5, Appendix B) or equivalent and 0.005-inch thick Visqueen plastic (item 6, Appendix B) or equivalent.

(4) Mask aircraft cowling openings using Anchor Continental BT-100 or equivalent (item 4, Appendix B); 3M Gray Duct Tape No. 393 (item 5, Appendix B) or equivalent 0.005-inch thick Visqueen plastic (item 6, Appendix B) or equivalent and reinstall the cowlings.

(5) Seal cabin door seams and any other liner gaps with a bead of hot glue (item 8, Appendix B, or equivalent). This material is used to seal seam covers and access panel gaps less than 3/16 inch.

WARNING

Molten plastic can severely burn exposed skin. Operators must wear gloves while hot gluing.

(6) Cover all transparent plastic and glass surfaces. Fabricate form-fitting shields for canopies and blisters from from 0.125-inch black rubber floor matting (NSN 7220-01-057-1897). Use Anchor Continental BT-100, (item 4, Appendix B, or equivalent), to mask transparency edges.

CAUTION

Transparent surfaces may be permanently damaged during PMB operations if not properly masked or covered with materials other than those listed in this specification.

(7) Mask or plug all remaining holes and gaps on the aircraft/component to prevent intrusion of plastic media into its interior areas. Also mask bearings, drive shafts, scuppers (drains), and all moving surfaces, actuators and linkages. Mask all cadmium plated, conversion coated, or anodized hardware that will not be replaced in subsequent operations.

(8) When stripping cockpit or cabin interior panels, additional masking is required to exclude media from smaller compartments and electrical items, such as wiring and connectors.

NOTE

Masking material may include cork, wood, foam, hot melt adhesive sticks, etc.

b. Mapping

(1) The mapping technique (unique for each Army aircraft model) provides a certified PMB operator with information allowing him to know what pressures, stand-off distances, and angle of impingement to use in removing the coating from the variety of painted aircraft panels having different skin thicknesses thus imparting a minimum stress and damage to the aircraft skins during the PMB operations.

(2) The mapping procedure is as follows:

(a) Develop a color chart based on the information in the specific aircraft DMWR and the manufacturer's blueprints, as required.

(b) Use the DMWR and blueprints to locate the aircraft panels, determine their respective skin thicknesses, and determine the material composition of each panel (e.g. aluminum, fiberglass).

(c) For the skin thickness of each panel and category (See Table I and II), assign a specific color.

(d) Outline each panel with spray paint using the same color assigned to the panels having the same thickness and material composition, for example: .020-inch thick aluminum alloy skin panels could be outlined with white spray paint and ".020" would be printed with white paint in the center of each panel. Repeat this procedure until all remaining aircraft panels are outlined with their respective thickness and assigned colors.

7.1.3 Aircraft Coating Removal Procedures

a. Position the cleaned and masked aircraft or components at the PMB site.

b. Dress PMB operators in the protective gear specified in Section 4.2.

c. Using a certified Hypodermic Needle Pressure Gauge, verify the indicated pressure readings adjacent to the nozzle (needle opening away from media flow) meet the requirements of Table III of MIL-P-85891A., Amendment 2, and Tables I and II, Column (c).

NOTE

The flow rate will be verified whenever media is changed or new media is added. Maintaining the media flow rate specified in Tables I and II is CRITICAL to prevent damage to the aircraft surfaces.

d. Ground all equipment and aircraft/components per Section 5.2.

e. Remove the organic coatings from the aircraft surface using plastic media Type V or VII using the operating parameters specified in Table I or II.

Begin the PMB operation by removing the coating from composite panels (fiberglass and Kevlar). To best prevent fibrillation (fuzzing) or any type of fiber damage, REMOVE ONLY THE TOPCOAT, leaving as much of the primer (MIL-PRF-23377 or MIL-PRF-85582) on the surface as possible. At least a light 'haze' of primer shall remain on all composite surfaces while media blasting to remove organic coatings.

Proceed to remove organic coatings from aluminum honeycomb panels and aluminum alloy panels with the lowest thickness values and continue to the next group of panels with increasing thickness until all of the organic coatings are removed from the bottom skins of the aircraft. Continue this same procedure with the remaining fuselage surfaces (top and sides) and the tailboom until all the organic coatings are removed. When the aircraft has been previously painted in CARC and is intended to continue with CARC, then remove only the topcoat, leaving as much of the sound primer (MIL-PRF-23377 or MIL-PRF-85582) remaining as possible.

NOTE

A minimum removal rate of 0.50 ft./min. shall be maintained.

f. The certified operator(s) should keep the nozzle moving at all times and maintain the stand-off distances, pressures, and impingement angles (angle of attack) specified in Table I or II. This technique will enable the operator to remove one layer of organic coating from the aircraft or component surfaces and will decrease the dwell time spent in any one area. Dwell time should not exceed specifications in Table I or II.

NOTE

Since PMB operations are physically tiring, the operators should be relieved at least every three hours by another certified operator. These rotations are necessary to maintain PMB operator efficiency and to prevent fatigued operators from damaging aircraft and component surfaces.

CAUTION

Certified PMB operators shall never direct a nozzle at other personnel. If more than one operator is engaged in the blasting operation at the same time, each operator shall be located on opposite sides and/or ends of the aircraft or equipment to ensure a safe separation distance. Moreover, operator(s) shall be equipped with ear phones to enable them to communicate with each other during the PMB operation.

g. PMB stripping of Kevlar panels will result in fibrillation (fuzzing) of the composite material. Fibrillation of Kevlar is known to cause a degradation of mechanical properties. On non-structural Kevlar panels the Kevlar fuzz can be removed. To affect repair, a thin coating of resin is reapplied to the substrate composite and allowed to cure. Any remaining fibers are then wet sanded until removed using a very fine grit sandpaper. Care should be exercised not to cause additional fibrillation through sanding. Once the resin surface has been readied for primer, a yellow epoxy-polyimide (MIL-PRF-23377) primer is applied (see NOTE below). The yellow color will be used as an indicator for future PMB stripping of the composite surface. Care should be exercised not to blast off the yellow primer with plastic abrasives during subsequent coating removal cycles. When stripping Kevlar surfaces, speed of coating removal should take secondary precedence over substrate protection.

NOTE

The yellow primer is not always present on the UH-60 with the original paint from the manufacturer. The first time each UH-60 has the coatings removed from the Kevlar panels, it will be particularly difficult for the PMB operator to detect when all coatings are removed. The operator should take extra care not to dwell on the bare Kevlar substrate as this will lead to rapid destruction of the composite.

TABLE I
TYPE V MEDIA
PLASTIC MEDIA BLASTING (PMB) PARAMETERS

(a) Material Thickness (inches)	(b) Supported/ Unsupported (Note 1)	(c) Air Pressure (psi) (Note 2)	(d) Media Flow Rate (lb/hr) (Note 3)	(e) Standoff Distance (inches)	(f) Impingement Angle (deg)	(g) Clad/ Non-clad	(h) Dwell Time (seconds)
ALUMINUM							
0.016 - 0.031	Supported	30 +2	450-480	18-24	15-30	Either	≤ 1
	Unsupported	30+2	450-480	18-24	≤15	Either	≤ 1
0.032 - 0.063	Supported	30+2	450-480	18-24	15-30	Either	≤ 1
	Unsupported	30+2	450-480	18-24	15-30	Either	≤ 1
0.064 +	Supported	30+2	450-480	18-24	60-80	Alclad	≤ 1
	Unsupported	30+2	450-480	18-24	45-60	Either	≤1
COMPOSITES							
All	Either	18-20	450-480	24-30	≤ 15	N/A	≤1

Notes:
1. Unsupported – No backing structure for surface being treated.
2. Taken at a 45 degree angle away from linear flow of the media using a hypodermic needle gauge.
3. All parameters based on a nozzle inside diameter of 0.50 inches.

TABLE II
TYPE VII MEDIA
PLASTIC MEDIA BLASTING (PMB) PARAMETERS

(a) Material Thickness (inches)	(b) Supported/ Unsupported (Note 1)	(c) Air Pressure (psi) (Note 2)	(d) Media Flow Rate (lb/hr) (Note 3)	(e) Standoff Distance (inches)	(f) Impingement Angle (deg)	(g) Clad/ Non-clad	(h) Dwell Time (seconds)
ALUMINUM							
≤ 0.025	Supported	20-25	960-1080	4-14	40-60	Either	≤ 1
	Unsupported	20-25	960-1080	4-14	40-60	Either	≤ 1
≥0.032	Supported	25-40	600-960	4-14	40-60	Either	≤ 1
	Unsupported	25-40	600-960	4-14	40-60	Either	≤ 1
COMPOSITES							
ALL	Either	20-30	600-960	4-22	20-40	N/A	≤1

Notes:
1. Unsupported – No backing structure for surface being treated.
2. Taken at a 45 degree angle away from linear flow of the media using a hypodermic needle gauge.
3. All parameters based on a nozzle inside diameter of 0.50 inches.

7.1.4 Clean-up and PMB Operations.

a. When the necessary organic coatings are removed by PMB, thoroughly vacuum all surfaces of the aircraft equipment, or component with a heavy duty, pneumatic type wet/dry vacuum cleaner to remove all plastic media dust and residual media.

b. Remove all masking materials from the masked items listed in Section 7.1.2.

c. Inspect previously masked interior areas and crevices for dust or media particle presence and vacuum as required.

7.1.5 Component Part Requirements after PMB

a. The part shall be free of dust, powder, or smut.

b. The part shall meet all drawing requirements for dimensional tolerances and for surface roughness.

c. Substrate coatings, (anodize, conversion coating, alclad) shall show no evidence of damage.

7.1.6 Preparation of Aircraft for Repainting

a. Clean in accordance with procedures of TM 55-1500-344-23.

b. Prepare for repainting as per the procedures of TM 55-1500-345-23.

8.0 QUALITY ASSURANCE (QA) REQUIREMENTS

8.1 QA shall monitor the PMB process and examine the end items making sure that the requirements of this specification are met (See Section 6.1).

8.2 QA shall verify and maintain records documenting that only certified operator personnel in accordance with Section 5.0 perform and monitor the PMB process.

8.3 QA shall verify that only an approved and properly maintained blast facility is used for this PMB process in accordance with Section 4.0.

8.4 QA shall verify that only certified plastic media is used for this process in accordance with Section 3.0.

8.5 The use of PMB to strip the fuselage should be permanently recorded, date and location, in the aircraft logbook.

8.6 Responsibility for Inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

9.0 DISPOSAL GUIDELINES FOR USED PLASTIC MEDIA

9.1 MIL-P-85891A, Amendment 2, Type V, acrylic resin, and Type VII, starch graft acrylic polymer are classified as non-hazardous materials and their use, transportation, and storage are not subject to environmental restrictions. As such, their resin or dust may be recycled or disposed of in sanitary landfills, in accordance with federal, state, and local regulations.

9.2 When Type V or Type VII PMB abrasives are used to remove aircraft coatings containing heavy metal pigments of arsenic, barium, cadmium, chromium, lead, mercury, selenium, or silver, the dust may be classified as hazardous waste, which may be determined by an EPA toxicity test. If the waste is found to be hazardous, its disposal should be in accordance with EPA (Federal), state, and local regulations where the plastic media blast operation takes place.

APPENDIX A

A.1 Media Contamination Test Procedures. This procedure is for use in installation laboratories.

a. Equipment/ Materials Required:

(1) One 500 milliliter (ml) Separatory Funnel.
(2) Rod Stand, for separatory funnel.
(3) Holding Rings, for funnels.
(4) Perfluorohexane, 3M P/N PF-5060, Cage 28112 (Building 223-6F-04).
(5) n-hexane, reagent grade, NSN 6810-01-063-4534.
(6) One glass funnel, 3-inch nominal diameter.
(7) One glass powder funnel (large stem), 4-inch nominal diameter.
(8) Whatman number 42 (or equal) filter paper, 12.5cm, to fit above funnel.
(9) Scale, 1000 grams capacity, 0.1 gram sensitivity.
(10) Analytical balance, 100 grams capacity, 0.001 gram sensitivity.

Costly dual range balances are available which offer bulk weighing and precision weighing in a single instrument. These may be substituted for the above two units, but have limited capacity.

(11) 500-600 ml tall Pyrex beaker.
(12) 250 ml Pyrex beaker.
(13) 500 ml graduated glass cylinder.
(14) Two jug-type glass storage bottles, 1-gal., with screw caps.
(15) Hydrometer, 1.60-1.80 specific gravity.
(16) Pyrex watch glass, 75-90mm diameter.
(17) Nalgene polyethylene wash bottles, 250 ml.
(18) Spatula, stainless steel.
(19) Glass stirring rods, 10-inch.
(20) Neoprene gloves, size as required.
(21) Specimen forceps.

b. Sampling Procedure: Collect approximately two liters of media.

(1) Used Media: The best representative sample is obtained by collecting media directly from the blast nozzle; but if this is not feasible, collect the sample from media hoppers (located after separation equipment in recovery/ reclamation system).

(2) New Media: The best representative sample is obtained by agitating the shipping container to thoroughly mix media prior to sampling. Given the size and weight of shipping containers, this could be difficult. So, new media may be sampled from the shipping container without agitation, if necessary.

c. Contamination Test Procedures:

(1) Ensure all glassware is clean and dry.

WARNING

Use solvents with caution. Keep away from heat and open flame. Keep container closed. Use only with adequate ventilation. Avoid prolonged or repeated contact with skin. Avoid swallowing.

(2) Prepare a mixture of five (5) percent by volume n-hexane and 95 percent by volume perfluorohexane. In order to facilitate mixing, add n-hexane to the mixing vessel first, then add the perfluorohexane fluid. The function of the perfluorohexane is to separate any dense particles from the plastic media. The specific gravity of the perfluorohexane is high enough to float the light plastic media while permitting any dense particles to settle. The purpose of the n-hexane is to resolve a problem with particles adhering to the sides of the separatory funnel in the following procedure. Care must be taken not to exceed the 5 percent content of n-hexane because it reduces the specific gravity and affects the flotation property of the mixture. The specific gravity of the mixture should read approximately 1.66 as determined with a hydrometer, but should never be below 1.60. A quantity of the mixture may be prepared in advance and stored until needed; however, storage should be in an appropriate small-neck storage bottle with a tight-fitting cap.

(3) Add approximately 300-350 ml (bulk dry volume) of sample media to a 500 ml beaker. Weigh the beaker and media to the nearest tenth gram (0.1 gm) and record (Weight #1) gross weight. Pour media into 500 ml separatory funnel (stopcock closed) and ensure there is no spillage. Obtain tare weight of 500 ml beaker and record (Weight #2) to the nearest tenth gram (0.1 gm).

(4) Add the fluid to the separatory funnel leaving some air space in the funnel for ease of agitation. Swirl the mixture. A swirling motion is more appropriate than shaking to reduce entrainment of air and suspension particles. Media samples may contain some dust sized particles which may be suspended in the fluid after agitation. Tapping the side of the funnel should dislodge any particles adhering to the sides. Place the separatory funnel on the rod stand using the holding ring. Allow 10 minutes for the suspended dust to settle or rise. Higher density particles will accumulate in the bottom of the separatory funnel on top of the stopcock.

(5) Fold the filter paper in a standard filter fold and place in funnel. Position the filtering funnel in a holding ring on the rod stand beneath the separatory funnel and place a beaker beneath the filtering funnel. Higher density particles will have settled out in the bottom of the separatory funnel (on top of stopcock). Use a short duration opening of the stopcock in order to drain higher density particles into the filter funnel. Tapping the side of the separatory funnel may help remove the high density particles. Do not allow the fluid level to get too low, which might allow some floating media to be deposited with the high density contaminants. Additional fluid may be added to the separatory funnel. Take care not to agitate the mixture. If agitation occurs, allow 10 minutes for suspended dust particles to float/settle prior to continuation of decantation. To separate all of the high density particles, the process has to be repeated until no particles will separate out of the plastic media. One attempt will not extract them all.

(6) Place the filter and filtrate in a vented, dust free location (preferably a laboratory hood) to dry for one hour. Measure the weight of the filter paper and filtrate to 0.001 gm precision. Allow the filter paper to dry an additional 30 minutes and reweigh. If there is a change greater than 0.001 gm continue to dry the sample, checking the weight every 30 minutes until the weight between intervals does not change. Obtain the tare weight of a watch glass, or on an electronic balance so equipped, reset the balance to zero (0) with the watch glass on the pan. Carefully remove the filtrate from the filter paper onto the watch glass by tapping. Unfold the filter paper and remove the remaining particles with a hard instrument, such as a metal spatula, until no visible signs of particles remain. Do not use a brush. Fine particles or dust may have impregnated the filter paper. This residue is not a major concern and may be disregarded because the fine particles (less than 80 mesh, U.S. Standard Sieve) are not damaging to aircraft materials or structure. Depending upon the balance used, weigh or calculate the weight of the dense particles to 0.001 gm precision and record as Weight #3.

(7) The mixed test fluid should be retained for reuse. Filter the used fluid mixture through a funnel with clean filter paper. Store in a separate, small-neck container, tightly closed and properly labeled. Recheck the specific gravity with a hydrometer to assure it is in the proper range prior to reuse.

(8) Calculations: Gross weight of media and 500 ml beaker (Weight #1) minus tare weight of 500 ml beaker (Weight #2) equals net weight of media.

Weight #1 - Weight #2 = Media Weight
Weight #3 = Dense Particle Weight

The Dense Particle Weight divided by the Media Weight equals the weight fraction of dense particles in the sample. Multiply the weight fraction by 100 to find the weight percent of dense particles in the sample.

(Dense Particle Weight/ Media Weight) x 100 = Percent Media Weight

(9) The contamination level (percentage) is a measure of all possible heavy contaminants listed earlier in this section. The high density contamination level (percentage) is a measure of silicates and metal particles. The high density contaminants (sand and glass in particular) tend to cause the most fatigue life degradation. The level of high density particles shall not exceed 0.02 percent as calculated above when the media is used to strip aerospace equipment. The high density contaminant level shall not exceed 2 percent when the media is used to strip non-aerospace equipment such as AGE or vehicles.

A.2 Procedure for Determining Residual Stresses to Metallic Substrates:

a. This test is used to assess the implied residual stress due to plastic media blasting.

b. Test Method:

(1) Shear a minimum of ten (10) Almen test strips (0.75" x 3.00") designed as per SAE AMS 2430N from 0.032 inch 2024-T3 bare aluminum sheet (Fed Spec QQ-A-250/4). Orient the 3.00-inch dimension of the Almen test strip in the rolling direction of the sheet.

(2) Subject the base aluminum Almen test strips to 30 seconds of continuous exposure from the plastic abrasive (media) and blast at a 30 psi nozzle pressure and a 30 degree angle of attack, using a 3/8-inch nozzle diameter and a minimum mass flow rate of 300 lbs/hr. Also use an 18 inch stand-off distance.

(3) Measure the average of ten (10) Almen test strip arc heights to the nearest 0.1 mil with a dial indicator. The average value is not to exceed the arc heights for the different mesh sizes shown below in Table A-1 for any plastic abrasive used. Mesh size classification for the varying size of plastic abrasive is defined in MIL-P-85891A and is shown below in Table A-2:

TABLE A-1
MAXIMUM ARC HEIGHT LIMITS

U.S. STANDARD SCREEN SIZE (Note 1)	MAXIMUM ARC HEIGHT (MILS)
12-16	<15.0
16-20	<12.0
20-30	<10.0
30-40	< 7.0

Note: 1. U.S. Standard screens can be purchased from Allied Fischer Scientific or equivalent

TABLE A-2
PARTICLE SIZE DISTRIBUTION

U.S. Standard Mesh Size	12-16 Maximum %		16-20 Maximum %		20-30 Maximum %		30-40 Maximum %	
	Retain	Pass	Retain	Pass	Retain	Pass	Retain	Pass
10	0.1	---	---	---	---	---	---	---
12	5.0	---	0.1	---	---	---	---	---
16	---	20.0	15.0	---	0.1	---	---	---
20	---	5.0	---	20.0	15.0	---	---	---
25	---	---	---	---	---	---	0.1	---
30	---	---	---	5.0	---	20.0	15.0	---
40	---	---	---	---	---	5.0	---	20.0
60	---	---	---	---	---	---	---	5.0
100	---	1.0	---	1.0	---	2.0	---	3.0

A.3 Procedure for Determining Minimum Stripping Rate of Plastic Media.

a. Preparation of Test Panels:

(1) Prepare test panels of 2024-T3 bare aluminum (6" x 12") for plastic media stripping as follows:

(a) Alkaline clean using detergent material conforming to SAE AMS 1640B.

(b) Deoxidize test panels using SAE AMS 1640B material.

(c) Within four hours, chemical conversion treat the test panels using MIL-DTL-81706 materials applied IAW MIL-C-5541.

(d) Apply epoxy primer (MIL-PRF-23377 Type II) to the chemically converted surface of the test panels to a dry film thickness of 0.0006 to 0.0009-inch. Allow primer to dry for at least 30 minutes.

(e) Apply polyurethane topcoat (MIL-PRF-85285, Type I, FED STD 595, Color No. 36495) to primed surfaces of the test panels to a dry thickness of 0.0017 to 0.0023-inch.

(2) Cure painted test panels for seven days in an air conditioned laboratory environment maintained at 72 degrees F and 50 percent relative humidity or conduct an accelerated cure of the test panels by curing in an oven maintained at 210 degrees F +/- 25 degrees F for a 96-hour period.

b. Monitoring Painted Test Panel Thickness:

(1) Monitor primer and topcoat thickness of each test panel to ensure paint thickness tolerance. Film thickness measurements should be directly measured to the substrate surfaces at six (6) locations for each panel.

(2) Film thickness measurements should be made IAW ASTM Standards B499 and B244 using a coating thickness gap to a resolution of 0.01 mils.

c. Determination of Stripping Rates.

(1) Blast at least five (5) painted test panels using a 3/8-inch diameter nozzle, a mass flow rate of 300 lbs/hr, 18-inch stand-off distance, a 30 degree angle of attack, and 30 psi nozzle pressure.

(2) Record the paint stripping times to the nearest 0.1 seconds and average the results for five (5) painted test panels. Express the results in square feet per minute (sq. ft/ min). Mesh sizes to be used are defined in the standard outlined in Appendix A, paragraph A.2. Minimum stripping rates are defined in Table A-3 below:

TABLE A-3
MINIMUM PAINT STRIPPING RATES

U.S. Standard Mesh Size	Minimum Mean Stripping Rate (ft^2/min)
12-16	0.35
16-20	0.30
20-30	0.20
30-40	0.10

A.4 Specification for Determining Plastic Particle Breakdown

a. Minimum breakdown rates for plastic abrasives are needed for both economic reasons and to minimize dust in the work environment.

b. Procedure:

(1) Blast a 10 pound U.S. Standard 20-30 mesh sample (conforming to particle size distribution in MIL-P-85891A, Amendment 2) against an aluminum plate, 15" x 15" x 0.25" conforming to QQ-A-250/12, T6 temper, until all of the abrasive medium charge is consumed.

(2) Blasting should be conducted in a pressure pot blast cabinet with the media reclamation system turned off or disabled. Blasting parameters are 1/4-inch nozzle at 60 psi nozzle pressure, 90 degree angle of attack to the plate with a 10-inch stand-off distance, and a minimum mass flow rate of 60 lbs/hr of abrasive media.

(3) After each blast cycle, collect the media and recharge the system. Repeat this procedure until five (5) complete blast cycles are completed. The particle size distribution of the collected abrasives after five (5) blast cycles shall be measured in accordance with MIL-P-85891A, Amendment 2. Particle size distribution of the blasting abrasive shall exceed that found in Table A-4 below:

TABLE A-4
PARTICLE SIZE DISTRIBUTION AFTER FIVE BLAST CYCLES*

U.S. Standard Mesh Size	Minimum Percent Retained
40	40
60	70

* Starting material is 20-30 mesh abrasive.

APPENDIX B

LIST OF CONSUMABLE MATERIALS USABLE IN PMB OPERATIONS

ITEM NO.	NOMENCLATURE	FEDERAL OR MILITARY SPECIFICATION NO. OR SOURCE
1	Aircraft Surface Cleaning Compound	MIL-C-43616
2	Plastic Abrasive, MIL-P-85891A, AMDT 2, Type V	E.I. DuPont de Nemours, Inc. Polymer Products Department P.O. Box 80800, Room 302 Wilmington, DE 19880-0800
3	Plastic Abrasive, MIL-P-85891A, AMDT 2, Type VII (eStrip GPX 20/50)	Archer Daniels Midland 995 Mill Street Montreal, Quebec Canada, H3C 1Y5
4	Blast Tape, P/N BT-100	Anchor Continental P.O. Drawer G Columbia, SC 29250
5	Gray Duct Tape, P/N 393	3M Industrial Specialties Division 220-7E 3M Center St. Paul, MN 55144
6	Visqueen Plastic	Ethyl Corporation, Visqueen Film Products P.O. Box 2448 Richmond, VA 23218
7	Masking Tape, P/N YR-500	3M Industrial Specialties Division 220-7E 3M Center St. Paul, MN 55144
8	All Purpose Hot Metal	EMHART Corporation Bostik Division Adhesive sticks Boston Street Middleton, MA 01949
9	Perfluorohexane, P/N PF-5060	3M PC&F Division 223-6F-04 3M CTR St. Paul, MN 55244
10	N-Hexane (Reagent Grade), P/N N-3-S	Fischer Scientific Co., LLC 2000 Park Lane Pittsburg, PA 15275