OAR Box 1176

Prepped by Ryan Dugan

Document Number:

198) IV-J-46

Docket Number:

A-90-49

RADIAN CORPORATION

A-90-49
IV-J-46

MEMORANDUM

DATE: January 27, 1992
TO: Source Category List Docket
FROM: Susan R. Fields, Radian
SUBJECT: Surface Coatings Materials Considered

The attached materials, submitted to Mr. Dave Salman of the U.S. Environmental Protection Agency for consideration under the plastic parts Control Technology Guideline project, were also considered in developing the description of the Large Aircraft (Surface Coating) source category for this project.

217

Rec'd 6/3/91

MCDONNELL DOUGLAS

April 11, 1991

Mr. Dave Salman, MD-13
U.S. Environmental Protection Agency
RTP, North Carolina 27711

Dear Sir:

Per our discussions at the Feb. 12, 1991 meeting, the attached information is being provided on the use of plastic parts coatings for aerospace military aircraft.

The enclosed information makes the assumption per our discussions that EPA is basically defining plastic parts as all non metal parts which may be used on a military aircraft. This would include such things as radomes, canopies, mounting brackets, gaskets, seals, as well as composite structures.

While this document focuses upon military aircraft, most other military products utilize plastic parts when plastic is broadly defined as above. The requirements for these parts will in general, be similar to that discussed in the attached documents.

As we discussed at the Feb. 12th meeting, the South Coast Air Quality Management District has a Plastic Parts Rule 1145. I'm assuming you are aware that this rule basically establishes a VOC limit for military specification coatings used on "military equipment". This means any military equipment other than that regulated under Aerospace Assembly and Component Manufacturing Operations Rule 1124. Under Rule 1124, the District doesn't differentiate between metal and plastic aerospace parts. If plastic parts which are part of aerospace assemblies or components are coated, then the coatings must meet the same requirements as for metal parts. Rule 1145 actually uses the VOC limit for aerospace primers and topcoats from Rule 1124 as the limit for "military equipment".

The South Coast District has recognized the difficulty in regulating VOCs from aerospace coating operations with multiple rules and has developed one rule (Rule 1124) to cover all aerospace coating operations.

We strongly encourage EPA to exclude aerospace plastic parts from the Plastic Parts CTG and develop the integrated Aerospace CTG as contemplated in the Clean Air Act Amendments. If you have any question, please feel free to contact the writer. We do look forward to working with EPA on this very important issue.

Sincerely,

Joseph H. Copeland
Principal Staff Consultant
Safety, Health & Environmental Affairs-MDC

cc: Susan Wyatt

P.O. Box 516, Saint Louis, MO 63166-0516 (314) 232-0232 TELEX 44-857

10 April 1991

Control Technique Guidelines for Miscellaneous Plastic Parts

Question 1: What are the typical plastic parts used on military products, such as the F15, F18 and AV8B?

Response: Military aircraft contain numerous non-metelic materials. Examples of these include structural composites, gaskets and seals, canopies, radomes, fairings, fluid lines (hoses), air ducts, mounting brackets, electrical circuit boards, and wire insulation. Approximately 2% of the structural weight of the F15 is boron and carbon/epoxy structural composites. The F/A18 and AV8B, respectively, contain 10% and 26% structural composites by weight. Future aircraft, such as the F23 Advanced Tactical Fighter will contain 30% to 50% structural composite materials. The actual usage of structural composites for the F15, FA18 and AV8B can be seen in the attached drawings.

The number and amount of miscellaneous plastics, such as air ducts, fluid lines, gaskets, seals, wire insulation, mounting brackets, electrical circuit boards, etc. has not been tabulated. However, they are utilized throughout the aircraft structure and its electrical and mechanical systems. Generally, several of these parts are not painted. Many are thermoplastics having molded in color.

Question 2: Where are these parts painted?

Response: Interior parts are mainly painted as detail parts. In some case, subassemblies may also be top-coated as well as primed. Exterior mold line parts (those visible composites shown in the attached figures) are generally top-coated in a final paint operation after installation of all the fasteners (painted as an assembled aircraft). This ensures a perfect match between the color and line of the camouflaged pattern. Any mismatches with adjacent structures would have a significant adverse effect upon the visual camouflage. Very minor differences in color or misaligned camouflage pattern will severely reduce the survivability of the aircraft in a combat environment.

Question 3: What are the requirements of the coating systems?

Response: There are three primary reasons for employing coating systems. 1) Paint aids visibility. For instance, wheel wells, avionic bays, and air inlets are painted gloss white for foreign object detection and to improve lighting when servicing equipment. Flat black paint in the cockpit eliminates glare. 2) Paint provides camouflage. This includes not only visual camouflage, but also low observable coatings to reduce infrared and radar signatures. 3) Paint also protects against dissimilar metal corrosion and corrosion due to the exposure of the structure to the environmental elements and offers ultraviolet protection for parts exposed to sunlight.

Question 4: What coating systems are used?

Response: Standard coating systems used on the F15, FA18, and AV8B are generally epoxy primers with a polyurethane top-coat. In addition, there are several specialty coatings including nickel filled paints for electromagnetic interference (EMI) protection, arc sprayed tin/zinc for lightning protection, fuel tank coatings, adhesion promoters, adhesive bonding primers, wing coatings, high-temperature coatings, rain erosion-resistant coatings and fire resistant coatings to name a few.

Question 5: What is the status of water based coatings?

Response: Water-borne coatings still contain a small amount of solvent, although the amount is 50% less than the standard solvent based system. In the past, water based coatings generally did not meet the military aircraft performance requirements. They lack such things as high and low temperature resistance, hot aircraft fluid resistance, and flexibility. Progress is being made in the performance of the water based coating systems and recent breakthroughs may result in an acceptable product for most applications in the next two to four years. This could expand the present limited usage.

Question 6: What are the military specifications requirements?

Response: Military specification MIL-F-7179 is a boiler plate specification which establishes a baseline for coating performance and corrosion protection. This specification represents the starting point for coating specifications specific to the requirements of the product. This specification directs the contractor to further develop coating requirements (specifications) where MIL-F-7179 may not provide sufficient protection depending upon the materials used in construction of the product, its operating envelope (speed, attitude, etc.) and its operating environment (desert, carrier deck, space, etc.). A copy of MIL-F-7179 is attached. From the baseline of MIL-F-7179 and special requirements of the product, the contractor will establish coating system requirements. These will be reviewed and approved by the customer and becomes part of the contractual requirements. MIL-F-7179 is a comprehensive specification covering selection, application and use of coating systems for military aircraft.

Question 7: What are the technical concerns when joining plastic parts and metals?

Response: The principle technical concern regarding joining of composites and plastic to metals is galvanic corrosion. Carbon fibers in composites and metal fibers in plastics form a galvanic couple with adjacent steel and aluminum parts. The electrical currents resulting from the dissimilar metals causes metal corrosion. Aluminum is widely used in aircraft structure and it is severely affected by corrosion associated with joining to composites. Paints are used to protect against this corrosion.

Question 8: What are the functions of coatings used on composite materials?

Response: Coatings on composites provide corrosion protection to the adjoining metal structures, provide camouflage or low observability to the outer mold line of the aircraft, and provide lightning or EMI protection. Composites within the aircraft interior which do not mate with metal are generally not painted, unless it is required by the military specification. An example is composite structure which is exposed when an access door is removed. In this instance, composite part is painted with a gloss white top-coat which functions as described earlier.

Question 9: Must parts be joined to metal structure before painting?

Response: Whether composite parts are joined prior to painting varies from part to part. Some parts require paint before joining to prevent dissimilar metal corrosion or to ensure EMI protection. Others are painted after assembly to ensure adequate color match and appropriate camouflage.

Question 10: What painting is done by prime contractors versus suppliers?

Response: Suppliers generally apply primer coatings to detail parts if the parts require coating per military specifications. The prime contractors apply both primer and top-coats. If a supplier fabricates a large subassembly, it may also apply the gloss white interior top-coat as described earlier.

Question 11: Why can't aerospace use molded in color for plastics?

Response: Military aircraft require camouflage paint schemes which are not achievable with molded in color. Parts which require solid colors may be candidates for molded in color, but fastener heads still require a coat of paint for corrosion resistance. Some interior parts can have molded in color where color match is not critical.

Question 12: Is consistency of molded color an issue?

Response: Consistency of painted color is critical for many aircraft applications. For instance, the camouflage patterns on outer mold line parts must match that on adjacent surfaces. Otherwise, you will lose the effects of the camouflage pattern and cause the aircraft to be more visible and decrease aircraft survivability. Cockpits require an exact color match. Otherwise, the different light reflections distract the pilot.

Question 13: Are plastic parts thermosets or thermoplastics?

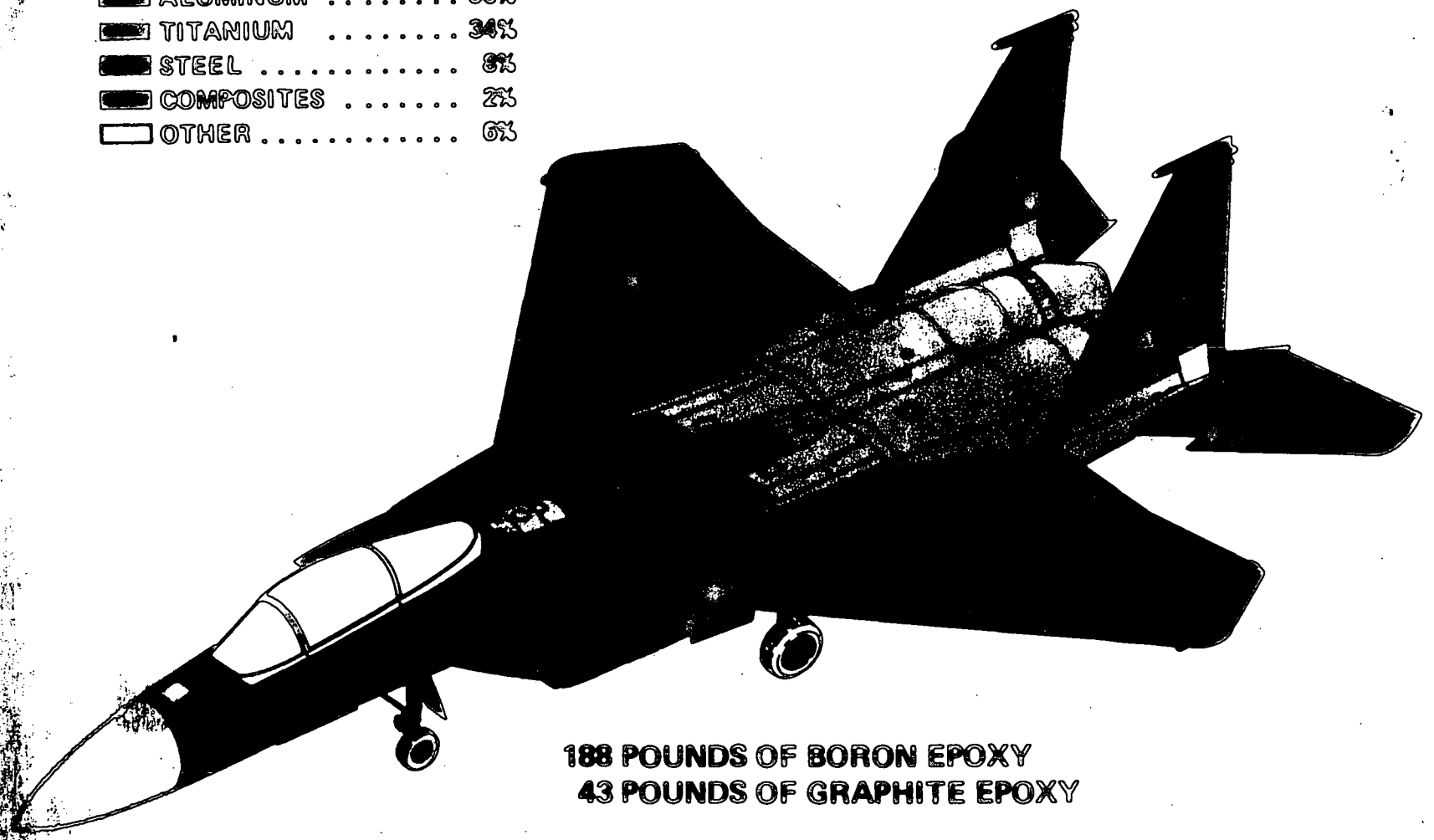
Response: The majority of plastic aircraft parts are thermoset polymers. Some thermoplastics are used, but they comprise less than 5% of the total plastics and composites used. Aircraft canopies are the largest user of thermoplastics.

Summary: Military fighter aircraft - Aerospace plastic parts employ the same coatings and coating processes as their metal counterparts. In addition, they are joined to metal parts to form an integral assembly. These assemblies are subsequently painted with camouflage or other top-coat paint schemes, as directed by military specification. Consequently, this integrated airframe assembly of plastic, composites and metal parts have common performance requirements necessitating a common approach to their regulation and control.

APPLICATIONS

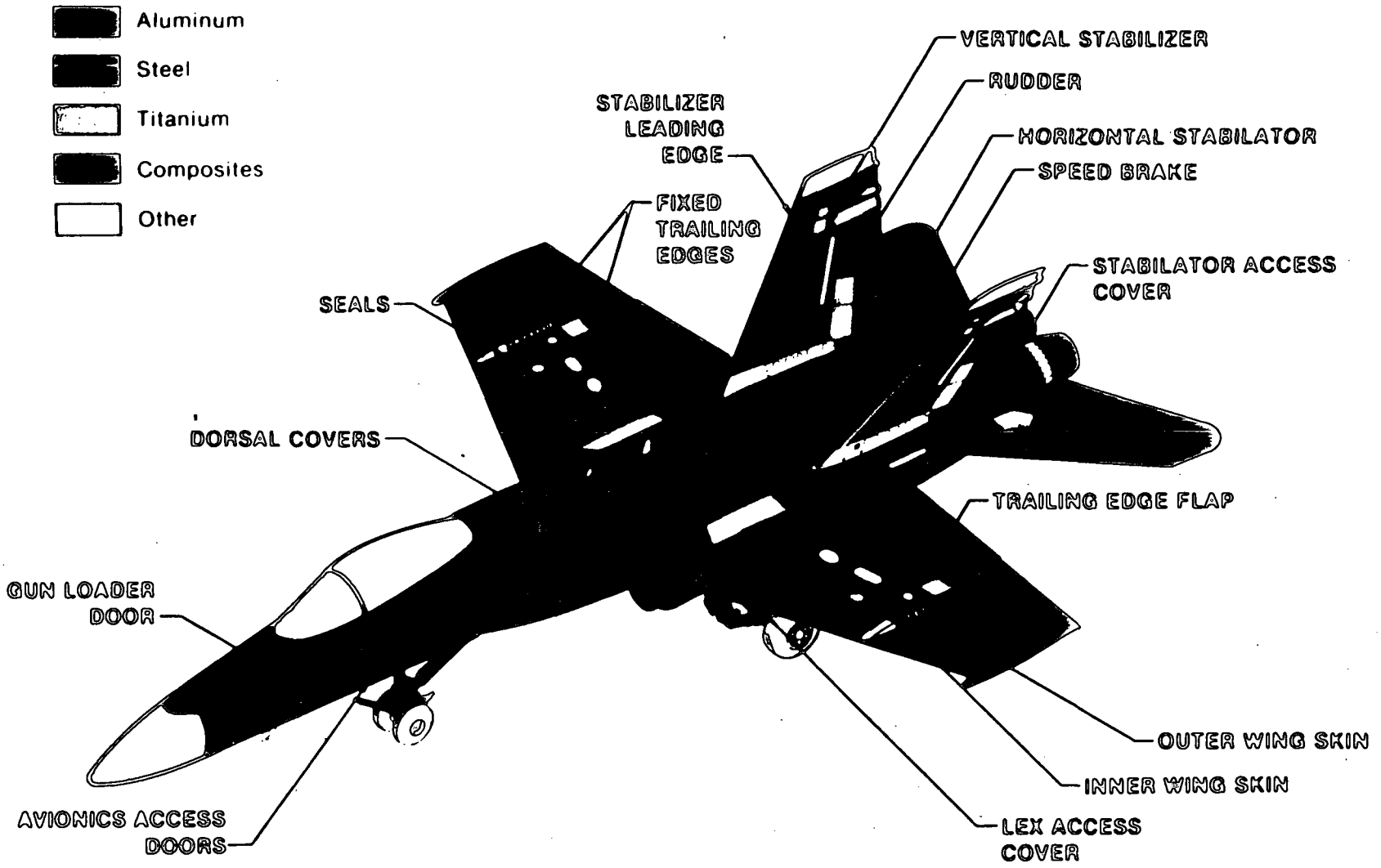
F-15 MATERIAL DISTRIBUTION

STRUCTURAL WEIGHT	
ALUMINUM	50%
TITANIUM	34%
STEEL	9%
COMPOSITES	2%
OTHER	6%



188 POUNDS OF BORON EPOXY
43 POUNDS OF GRAPHITE EPOXY

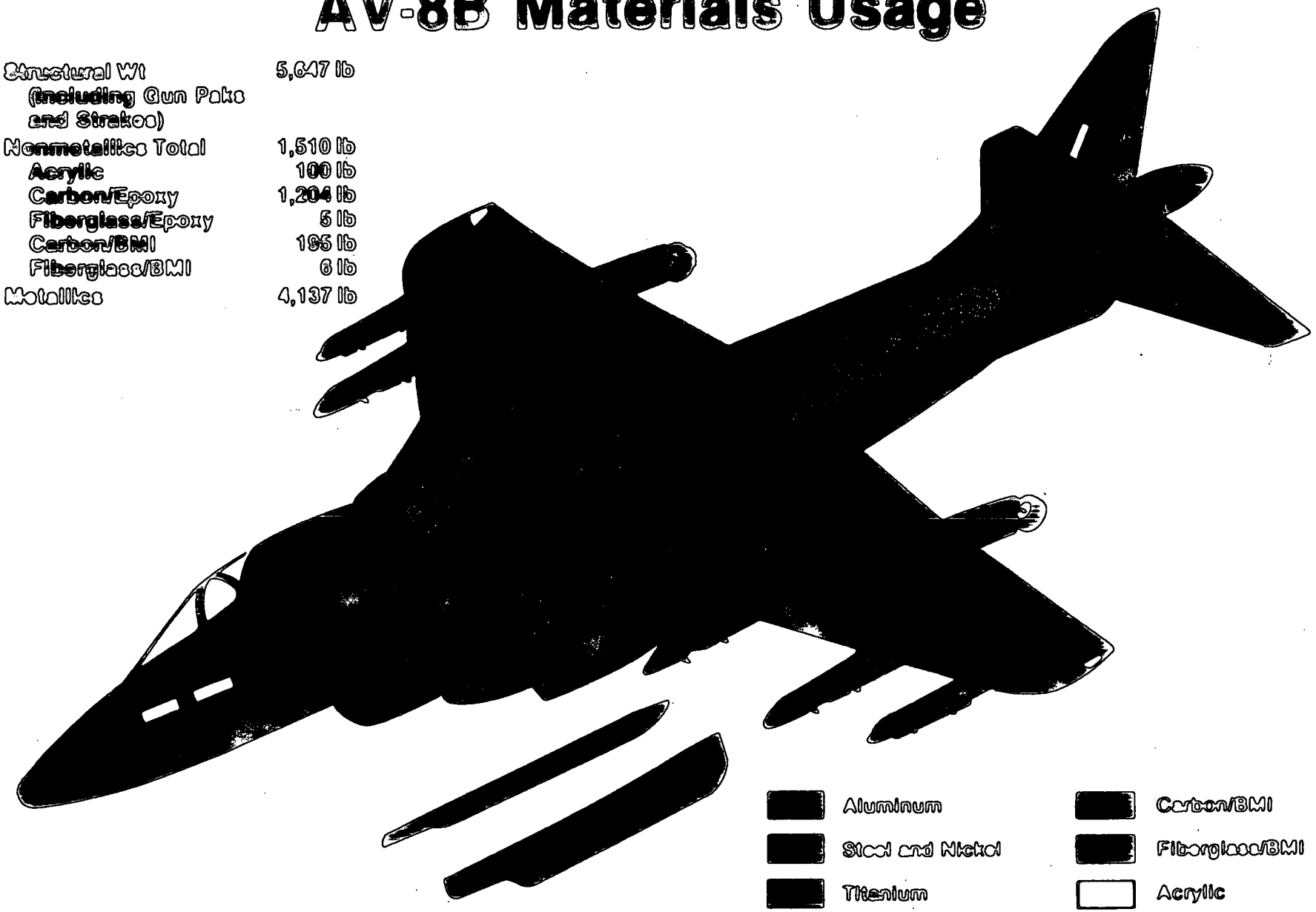
F/A-18
COMPOSITE APPLICATIONS



QP13-0330-3
JANUARY 1991

AV-8B Materials Usage

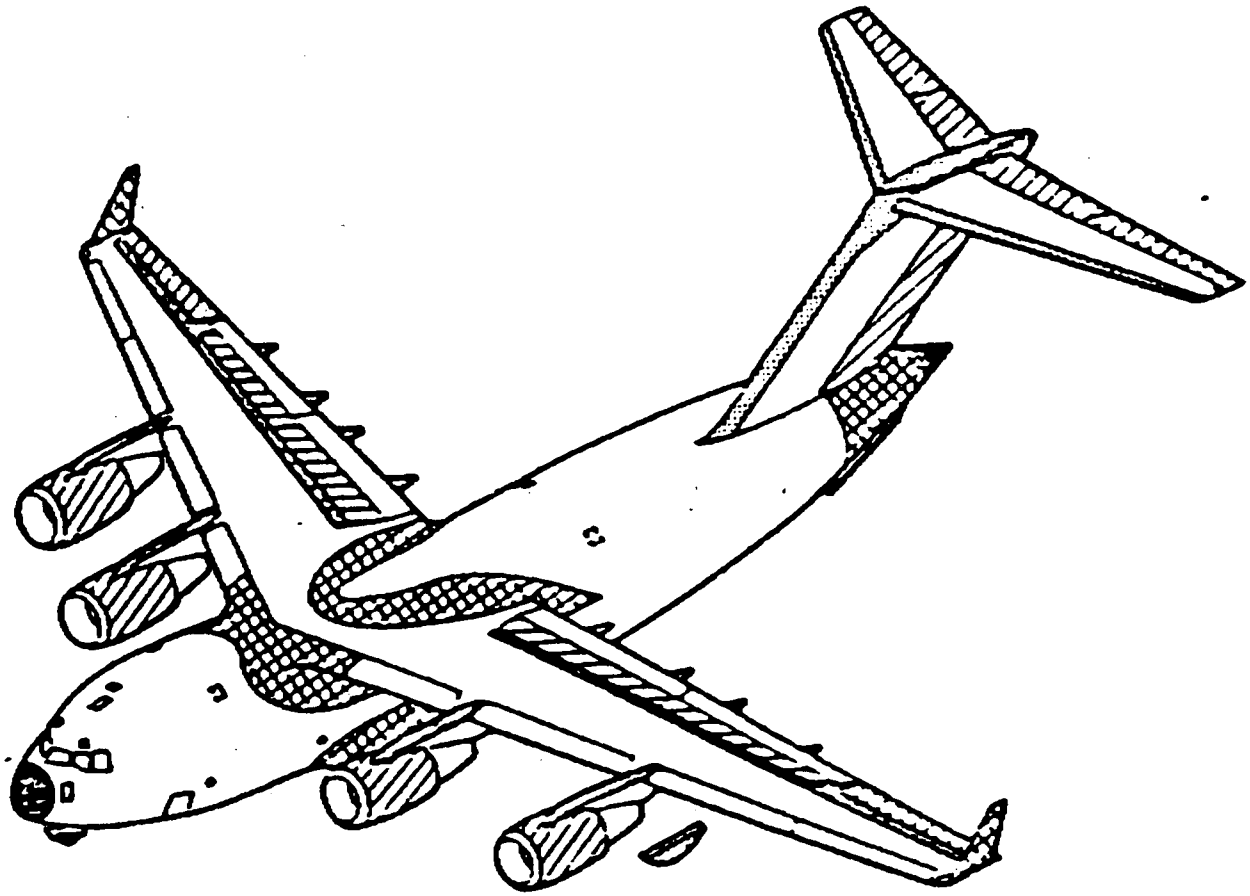
Structural Wt (including Gun Pods and Strakes)	5,647 lb
Nonmetallics Total	1,510 lb
Acrylic	100 lb
Carbon/Epoxy	1,204 lb
Fiberglass/Epoxy	5 lb
Carbon/BMI	195 lb
Fiberglass/BMI	6 lb
Metallics	4,137 lb



- Aluminum
- Steel and Nickel
- Titanium
- Carbon/Epoxy
- Fiberglass/Epoxy
- Carbon/BMI
- Fiberglass/BMI
- Acrylic
- Other

figure 3

C-17 COMPOSITE APPLICATIONS



CARBON/EPOXY
GFRP/NOMEX CORE
KEVLAR/NOMEX
KEVLAR/FOAM CORE
CARBON/KEVLAR/EPOXY
CARBON/NOMEX

[redacted]

MIL-F-7179F
AMENDMENT 1
20 May 1985

MILITARY SPECIFICATION

FINISHES, COATINGS, AND SEALANTS FOR THE

PROTECTION OF AEROSPACE WEAPONS SYSTEMS

This amendment forms a part of Military Specification MIL-F-7179F dated 25 September 1984, and is approved for use by all Departments and Agencies of the Department of Defense.

PAGE 17

TABLE I, add the following note: "The use of MIL-P-85582 or MIL-P-23377 containing chlorinated solvent(s) on U.S. Air Force Weapon Systems must be specifically approved by the acquiring activity".

Custodians:

Army - MR
Navy - AS
Air Force - 20

Reviewer activities:
Army - AR, AV, MI
Navy - OS
Air Force - 99

Preparing activity:

Navy - AS

(Project MFFP-0332)

AREA MFFP

DISTRIBUTION STATEMENT A,
APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION IS UNLIMITED.

MIL-F-7179F
25 September 1984
SUPERSEDING
MIL-F-7179E
15 November 1972

MILITARY SPECIFICATION

FINISHES, COATINGS, AND SEALANTS FOR THE PROTECTION OF AEROSPACE WEAPONS SYSTEMS

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes the minimum requirements for finishes, coatings and sealants to be used for protection of aerospace weapons systems.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

Federal

TT-L-190	-	Linseed Oil, Boiled. (For Use in Organic Coatings).
TT-P-28	-	Paint, Aluminum, Heat Resisting (1200°F).

Military

MIL-R-3043	-	Resin-Coatings, Unpigmented, For Engine Components and Metal Parts.
MIL-C-5002	-	Surface Treatments and Inorganic Coatings For Metal Surfaces of Systems.
MIL-C-5056		Coating, Permanent Resin, Process For Application of, to Aircraft Parts.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AREA MFFP

NO DELIVERABLE DATA REQUIRED BY THIS DOCUMENT

SPECIFICATIONS (Continued)

Military (Continued)

MIL-B-5087	-	Bonding, Electrical, and Lighting Protection, For Aerospace Systems.
MIL-C-5541	-	Chemical Conversion Coatings on Aluminum and Aluminum Alloys.
MIL-C-6529	-	Corrosion Preventive, Aircraft Engine.
MIL-R-7705	-	Radomes. General Specification For.
MIL-A-8625	-	Anodic Coatings, For Aluminum and Aluminum Alloys.
MIL-C-8779	-	Colors, Interior, Aircraft, Requirements For.
MIL-S-8802	-	Sealing Compound, Temperature-Resistant, Integral Fuel Tanks and Fuel Cell Cavities, High-Adhesion.
MIL-C-11796	-	Corrosion Preventive Compound, Petrolatum, Hot Application
MIL-C-16173	-	Corrosion Preventive Compound, Solvent Cutback, Cold-Application.
MIL-C-18263	-	Colors, Exterior, Naval Aircraft, Requirements For.
MIL-F-18264	-	Finishes, Organic, Weapons System, Application and Control of.
MIL-I-18464	-	Insignia and Markings for Naval Weapons Systems.
MIL-C-22750		Coating, Epoxy-Polyamide.
MIL-P-23377	-	Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistant.
MIL-M-25047	-	Markings and Exterior Finish Colors For Airplanes, Airplane Parts and Missiles (Ballistic Missiles Excluded).
MIL-C-27725	-	Coatings, Corrosion Preventive, For Aircraft Integral Fuel Tanks.
MIL-C-46081	-	Coating Compound, Thermal Insulating (Intumescent).
MIL-A-46146	-	Adhesive-Sealants, Silicone, RTV, Non-corrosive (For Use With Sensitive Metals and Equipment).
MIL-C-46168	-	Coating, Aliphatic Polyurethane, Chemical Agent Resistant.
MIL-P-52192	-	Primer Coating, Epoxy.
MIL-G-81322	-	Grease, Aircraft, General Purpose Wide Temperature Range.
MIL-S-81733	-	Sealing and Coating Compound, Corrosion Inhibitive.
MIL-C-83231	-	Coating Polyurethane, Rain Erosion Resistant, For Exterior Aircraft and Missile Plastic Parts.
MIL-C-83286	-	Coating, Urethane, Aliphatic, Isocyanate, For Aerospace Applications.
MIL-A-83377	-	Adhesive Bonding (Structural) for Aerospace and Other Systems, Requirements for.
MIL-S-83430	-	Sealing Compound, Integral Fuel Tank and Fuel Cell Cavities, Intermittent Use to 360°F (182°C).
MIL-C-83445	-	Coating System, Polyurethane, Non Yellowing, White, Rain Erosion Resistant, Thermally Reflective.
MIL-T-83483	-	Thread Compound, Antiseize, Molybdenum Disulfide - Petrolatum.
MIL-C-85054	-	Corrosion Preventive Compound, Water Displacing Clear (Amlguard).
MIL-C-85285	-	Coating, Polyurethane, Aliphatic, Weather Resistant, Low Infrared (IR) Reflective.

SPECIFICATIONS (continued)

Military (continued)

MIL-C-85322	-	Coating, Elastomeric, Polyurethane, Rain Erosion Resistant, For Exterior Aircraft Use.
MIL-P-85582	-	Primer Coatings: Epoxy, VOC Compliant, Chemical and Solvent Resistant

STANDARDS

Military

MIL-STD-143	-	Standards and Specifications, Order of Precedence For the Selection of.
MIL-STD-171	-	Finishing of Metal and Wood Surfaces.
MIL-STD-889	-	Dissimilar Metals.

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein.

PUBLICATIONS

UNITED STATES ARMY

Technical Bulletin 746-93-2 - Painting and Marking of Army Aircraft.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the acquiring activity or as directed by the contracting officer.)

2.1.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Instructions to contractors.

3.1.1 General. The application of all organic finishes prescribed herein shall be in accordance with MIL-F-18264. It shall be the responsibility of the contractor to insure that areas of a weapons system exposed to extreme conditions are protected by finishes that have been demonstrated to the satisfaction of the acquiring activity to be suitable for the purpose. Extreme conditions include exhaust trails, gun-blast surfaces, rocket-blast areas, or areas that may trap or be exposed to fumes from exhaust, guns or rockets; hull bottoms, leading edges, surfaces subjected to temperatures above 250°F as the result of thermal radiation, aerodynamic heating, or other sources of heat; and other surfaces that may require protection other than the standard finish. It shall be the responsibility of the contractor to establish clearly the areas affected as a result of prior experience, test information, and analysis based on the mission profile and planned use of the weapons system.

3.1.1.1 Exceptions. Unless specifically referenced in the pertinent item or accessories specifications or drawings, this specification does not apply to equipment such as propellers, powerplants, instruments, electronic enclosures or chassis, nor to standard contractor purchased accessories, such as electric motors, generators, switches, hydraulic valves and similar parts. Contractors are not required to refinish such equipment or accessories, provided that the finish and color thereon are acceptable to the contractor and the local Government representative. However, all surfaces in contact with parts covered herein shall be protected in accordance with the requirements of this specification.

3.1.2 Contractor's finish specification. A specification delineating the protective finish, including cleaning and surface treatment, to be applied to the contractual articles shall be developed by the contractor and submitted for approval to the acquiring activity. When the contractor's finish specification references manufacturer's material, process finishing specifications, and other documents, these shall be cross indexed showing their equivalency to existing Government specifications or standards and copies of all referenced contractor originated documents shall be submitted with the proposed finish specification. This specification (MIL-F-7179) shall be used as the basis for preparation of the finish specification which shall follow the format thereof. A detailed parts list is not required. Sufficient examples shall be listed in order that any part of the system may be properly classified as to detailed protective treatment. All parts for which the exact treatment may be in doubt and all the areas in 3.1.1 requiring special treatment shall be listed. Parts or assemblies with design features specifically noted in other specifications requiring optimum corrosion preventive treatment shall also be listed. Where alternative materials or processes are allowed herein, the contractor shall list only those alternatives he intends to use. Proposed deviations from or additions to the requirements of this specification shall be marked with an asterisk, and shall be accompanied by sufficient explanation, including test data as may be required, to permit an engineering evaluation. It shall be the responsibility of the prime contractor to ensure that sub-contractors meet the contractor's finish specification.

3.1.3 Selection of specifications and standards. The order of precedence for the selection of specifications and standards for the development of the contractor's finish specification shall be in accordance with MIL-STD-143.

3.2 Materials and processes. All materials used shall conform to the requirements of the Government specifications and standards referenced in this document. Materials not defined by referenced Government specifications, standards and related documents shall not be used without approval.

3.3 Work done prior to material inspection. Any finishing coating, or sealing work done before the materials are approved shall be at the risk of the contractor. If the materials fail to meet the applicable specification requirements in any respect, the lot of material shall be rejected. Any coating and sealing work accomplished using rejected material will require rework using approved material.

3.4 General protective finish system requirements for exterior and interior surfaces.

3.4.1 Protective coating requirements. Acceptable topcoat protective coatings and compatible primer specifications shall be as specified in Table I unless requirements for other topcoats and their compatible primers are specified in the individual coating specifications. The coatings shall be applied to weapon systems in accordance with MIL-F-18264 to conform to the requirements of Table II.

3.4.1.1 Protective coating thickness requirements. The minimum acceptable protective coating applied dry film thickness requirements for the coating materials in Table I are specified in Table II. The maximum acceptable applied dry film thickness of the protective coatings in Table I shall be as required by the respective materials specification except for the applied primer coating dry film thickness required for interior surfaces of all types of materials and the exterior surface of magnesium which shall not exceed the thicknesses specified in Table II by more than 50 percent.

3.4.2 Surface treatment. All metal surfaces, regardless of whether they are to be painted or are specifically excluded from painting requirements, shall be surface treated in accordance with MIL-S-5002, except as modified by 3.6.2.1b.

3.4.3 Interior surfaces. The interior surfaces of parts, assemblies, etc. shall be primer coated with the materials specified in Table I to the applied dry film thickness specified in Table II, and 3.4.1.1, except that the topcoat may be applied after final assembly subject to the requirements specified in paragraph 3.6.2. For interior surfaces where a top coat of primer has been applied, it may be necessary to apply an additional coat of primer. The primer coatings shall be applied in accordance with MIL-F-18264.

3.4.4 Exterior surfaces. The exterior surfaces shall be coated with the primers and topcoats specified in Table I to the applied dry film thicknesses specified in Table II and 3.4.1.1. The coatings shall be applied in accordance with MIL-F-18264. (See 6.2.3 for definition of exterior surfaces.)

3.5 General precautions.

3.5.1 Metal particles. Fabrication and assembly procedures shall be established which avoid the retention of metal particles or pieces such as chips, slivers and filings, and preclude the retention of rivets, bolts and tools in structures. A vacuum cleaner providing strong suction shall be employed for frequent cleaning operations in relatively inaccessible areas. Metal cutting or filing is not permitted on an assembly after it has been accepted, except upon specific approval of the local Government representative; such areas shall be retouched in accordance with the detailed paint schedule for the part.

3.5.2 Use of abrasive materials. The use of steel wool or steel-wire brushes is prohibited on all metals, except low-alloy steel. Only aluminum and fiber wool or bristles, or fine grain aluminum oxide abrasive paper, cloth, or pads, shall be used on other metals. The selection of the correct abrasive material and size is dependent on the material/surface to be treated and the purpose for which the abrasive materials will be used. Applicable technical orders, technical bulletins, or manuals should be consulted before selecting the abrasive material and size.

3.5.3 Welding, brazing and soldering. When welding, brazing, or soldering is permitted on an assembly after it has been finished, inspected, and accepted, appropriate refinishing shall be accomplished.

3.6 Requirements applicable to specific parts.

3.6.1 General. In applying the requirements of this section, the groupings of the more commonly used aircraft metals shall be in accordance with MIL-STD-889, except that the protection requirements in 3.6.14 for attaching parts shall prevail despite any contrary interpretation of the standard. Metal foils or shims shall not be used on exterior surfaces.

3.6.2 Faying surfaces, joints and seams.

3.6.2.1 Surfaces of similar metals. All seams in which the faying surfaces are similar metals, as defined by MIL-STD-889, shall be protected by applying to each surface the same thickness of primer as prescribed for interior surfaces (see 3.4.3). Exceptions to the foregoing are:

a. Where Table II and 3.4.1.1 specifies application of a specific thickness of primer to faying surfaces, only one-half of that thickness of primer need be applied to each surface being joined.

b. Resistance-welded faying surfaces shall not be primed but approved weld-through sealants shall be used prior to assembly. Faying surfaces shall be primed to the extent practicable after spot-welding, and all exterior edges shall be sealed.

c. Faying surfaces that are to be adhesively bonded shall be surface cleaned, treated, and processed, as specified in the approved bonding procedures prescribed for the assemblies concerned and in accordance with MIL-A-83377.

d. Titanium to titanium and corrosion resistant steel to corrosion resistant steel constructions shall be protected by primer or sealant in the faying surfaces. Where protection against fretting is required for the above type of construction, the contractor shall propose a method of protection for approval by the acquiring activity.

e. In addition to any required primer coating, all exterior faying surfaces, seams and edges shall be coated with a sealing compound conforming to MIL-S-81733, MIL-S-8802, MIL-S-83430, or other sealant approved by the acquiring activity. A minimum gap of 0.020 inch is required at exterior surface butt joints to allow for effective sealing. (See 6.2.3 for definition of exterior surfaces.)

3.6.2.2 Defect filling. The use of filling material for the purpose of sealing and concealing nicks, dents, gouges, and poor joints is prohibited.

3.6.3 Surfaces of dissimilar metals. Except as specified in 3.6.16, each surface shall receive a minimum of 0.0006 inch of primer, or when the surfaces

are to be fay surface sealed with MIL-S-81733, MIL-S-8802, or MIL-S-83430, the thickness of primer applied to each surface shall conform to Table II and 3.4.1.1. In addition, the following precautions shall be taken.

a. Where magnesium is one of the metals of dissimilar metal faying surfaces, sealing compounds conforming to MIL-S-81733, MIL-S-8802, MIL-S-83430, or other sealant approved by the acquiring activity shall be applied between the surfaces and squeezed out of all boundaries. The excess shall be removed in a manner that will fillet all edges. Except for bushing installations, the fillet width shall be not less than 1/4 inch. For bushings, the fillet shall be the largest practicable. Joint areas which would retain water shall be filled with a sealing compound.

b. Butt joints in exterior locations consisting of dissimilar metals shall be protected by grooving the seam to a width of 0.090 ± 0.030 inch and filling with sealing compound. The depth of the groove shall be sufficient to retain the hardening type sealing compound, which shall be subsequently applied and smoothed flush with the surfaces of adjacent dissimilar metals.

c. Joints composed of graphite/epoxy composite and aluminum (or other dissimilar metal as defined in MIL-STD-889) shall have an interfacing surface of glass fabric/epoxy resin applied as the final ply on the composite. The glass fabric/resin ply shall extend 1/4 inch beyond the metal member. A 0.0012 inch thick primer coating shall be applied to each of the interfacing surfaces and permanent joints shall be faying surface sealed with sealing compound. Joints that require separation as part of normal maintenance may have formed-in-place seals substituted for faying surface sealing.

3.6.4 Sealing. For exterior locations as defined in 6.2.3, openings (except drain holes at low points) which are not required for aircraft operation shall be sealed to prevent fluid entry from external sources. Sealing around access plates shall be accomplished by applying the sealant to the structure in a manner so that the access plates can be removed without damaging the formed-in-place sealant or surrounding metal. The minimum thickness of sealant for formed-in-place seals shall be 0.030 inch.

3.6.5 Slip fits. Slip fits shall be assembled using wet MIL-P-23377 or MIL-P-85582 primer or wet MIL-S-81733, MIL-S-8802, or MIL-S-83430 sealants. If design requires disassembly, the MIL-P-23377 epoxy primer shall be applied and permitted to dry thoroughly before assembly. Where these materials are not compatible with the function of the part, preservative compound conforming to MIL-C-16173, Grade 1 or Grade 2, shall be used.

3.6.6 Press fits. Except for parts permanently housed in grease or oil, the pressing shall be accomplished with either wet MIL-P-23377 epoxy primer, or wet MIL-S-81733, MIL-S-8802, or MIL-S-83430 sealants. Exterior edges of the press fit shall be sealed with sealant, except that sealing with primer shall be permitted for bushings with thin walls of 0.094 inch or less. The completed assembly shall then be finished as specified in Table II. and 3.4.1.1. Parts permanently housed in grease or oil shall be assembled with the grease or oil to be used in the housing.

3.6.7 Cut edges. The edges of all metals shall be rounded to permit adhesion of an adequate thickness of applied paint coatings or sealants. After rounding of edges, and prior to the application of paint or sealant, applicable chemical surface treatments shall be applied.

3.6.8 Functional surfaces. Paint type coatings shall not be applied to functional, working or wearing surfaces, to lubricated surfaces, to adjustable screw threads, to lubrication holes or drain holes or any other surface where their application will cause malfunction of the part or system, except that the walls of the drain hole shall be painted for corrosion protection.

3.6.9 Control cables and control chains. Control cables and control chains shall not be painted. Control cables shall, however, be protected by a dip-coating of material conforming to MIL-C-16173, Grade 1 or 4, or other approved corrosion-preventive materials prior to installation. After installation, they shall be inspected and touched up with the same materials or material conforming to MIL-C-16173, Grade 1, for cables in exterior locations, or MIL-C-16173, Grade 4, for cables in interior locations of the weapons system, except those surfaces requiring lubrication for functional purposes shall be cleaned and coated with the required lubricant in lieu of corrosion preventive material. Nylon jacketed cables do not require treatment, except for exposed end fittings.

3.6.10 Closely coiled springs. Springs that are closely coiled, preventing the application of plating to internal surfaces, or springs not plated for other reasons, shall receive 0.0012 inch of primer or shall be coated with materials conforming to MIL-G-81322.

3.6.11 Parts in oil or grease. Baked resin coatings conforming to MIL-R-3043 shall be applied in accordance with MIL-C-5056 to parts which are housed in lubricating oil, hydraulic oil, or grease. Parts constructed of corrosion-resistant metals need not be coated unless they contact dissimilar metals. Functional surfaces, such as bearing surfaces, shall not be coated.

3.6.12 Metal tanks.

3.6.12.1 Welded fuel tanks (including external auxiliary fuel tanks). The inside surfaces of aluminum-alloy tanks shall not be painted. Spare tanks shall be thoroughly cleaned, chemical conversion coated with material conforming to MIL-C-5541, sloshed with corrosion preventive compound conforming to MIL-C-6529, Type II, and drained. Droppable steel tanks shall be coated on the interior with a baked resin finish conforming to MIL-R-3043.

3.6.12.2 Integral and riveted fuel tanks. The inside surface of integral or riveted tanks shall be suitably finished and sealed to prevent corrosion and leakage of fuel. Faying surfaces of the interior, whether sealed or not, shall receive the thickness of primer established by Table II and 3.4.1.1. Corrosion preventive coating conforming to MIL-C-27725 shall be applied to the interior surfaces. MIL-C-27725 shall not be applied to exterior surfaces.

3.6.12.3 Temporary and auxiliary fuel tanks. The inside surfaces of aluminum-alloy tanks shall not be painted. The interior of steel tanks shall be finished with material conforming to MIL-R-3043.

3.6.12.4 Lubricating oil and hydraulic oil tanks. The inside surfaces of oil tanks made of corrosion-resisting metals shall require no paint. Tanks of other materials shall be coated with material conforming to MIL-R-3043.

3.6.12.5 Miscellaneous aluminum alloy tanks. Interior surfaces of miscellaneous aluminum alloy tanks, except potable water tanks, shall be surface treated in accordance with MIL-A-8625 or MIL-C-5541.

3.6.13 Tubing.

3.6.13.1 Plumbing line (fuel, water and other nonstructural tubing). Interior and exterior surfaces of aluminum-alloy tubing shall be surface-treated in accordance with MIL-C-5541 or MIL-A-8625. No paint coatings shall be applied to the interior surfaces of airspeed indicator tubing, oxygen tubing or other plumbing lines. Tubing in methylbromide or trifluorobromide fire-extinguishing systems shall be finished internally and externally with baked resin coating conforming to MIL-R-3043. The process shall be in accordance with MIL-C-5056. All plumbing lines, except titanium alloy, corrosion-resistant alloy and heat resistant alloy tubing, installed in interior or exterior locations shall receive the complete interior or exterior paint system, as applicable, and shall be protected in the following manner:

a. Tubing categories. For the purpose of this specification, tube assemblies are defined in the following categories:

   I Single tubes having separable connections at each end.

   II Assemblies comprised of individual tubes permanently joined by nonseparable type fittings (such as those assembled by brazing, welding and swaging), and having separable type connections at each free end.

   III Single or multiple tube assemblies as in I and II above, having one or more free ends which must be subsequently joined permanently to another tube assembly (by brazing, welding and swaging) during installation.

   IV Other types of tube assemblies not covered in Category I, II, or III.

b. Application of primer: Tube assemblies in Category I shall be painted with primer after all required forming operations have been completed and prior to fabrication of the assembly. Tube assemblies in Categories II and III shall be painted with primer followed by coating of joints with MIL-S-81733, MIL-S-8802, MIL-S-83430 or MIL-C-85054 coating after all required bending and permanent joining has been completed and prior to final fabrication of the assembly. For tube assemblies in Category III employing a permanent joining process not compatible with the primer during fabrication, the primer may be omitted a suitable distance from the affected free ends. For assemblies in Categories I, II and III in which sleeves or ferrules are used in the separable connection, and the sleeves or ferrules are fixed in position by deforming one or both members into intimate contact, the primer need not extend beyond the initial point of intimate contact. Tubing for use with flared fittings must be completely primed to the end of the tube.

c. Final paint system: Tube assemblies in Categories I, II and III shall receive the appropriate paint system after fabrication and prior to installation except for those assemblies in Category III which have been only partially primed. These assemblies shall have additional primer applied as required, and when feasible, followed by coating of all nonseparable joints with MIL-S-81733, MIL-S-8802, MIL-S-83430 or MIL-C-85054 and application of the complete exterior paint system. Finish on any tube assembly which has been damaged during installation shall be retouched. For Category IV tube assemblies, the contractor shall establish a suitable paint protection system acceptable to the acquiring activity. Plumbing lines of the 5000 and 6000 series aluminum alloy in fuel tanks require surface treatment and coating with material conforming to MIL-C-27725.

d. Protection of joints after installation: After installation of the tube assemblies, all remaining nonsealed joints, which will not be disconnected during normal servicing, will be coated with MIL-S-81733, MIL-S-8802, MIL-S-83430, or MIL-C-85054 followed by the appropriate paint system. All remaining nonsealed joints, which must be disconnected during normal servicing, will be coated with MIL-C-16173, Grade 4, or MIL-C-85054 which shall seal all exposed spaces between the parts. A second coat of the same material shall be applied to the same areas after a period of 1 hour. Contractor-prepared maintenance instructions shall require periodic reapplication of this material in service.

3.6.13.2 Structural steel tubing. All surfaces, inside and outside, of structural steel tubular assemblies shall be finished in accordance with Table I and II and 3.4.1.1, except as follows: Assemblies completely closed by welding or to which application of epoxy primer is not practicable or not effective, such as crimped-end tubing not closed by welding or tubing heat treated after assembly, shall be treated after assembly (and heat treatment, if performed) with hot linseed oil conforming to TT-L-190, or compound conforming to MIL-C-11796 or MIL-C-16173, Grade 2. The liquid shall be applied by forcing it into the hollow member under pressure through holes drilled therein, or by immersing the part in a bath of the liquid. For a large structure, interconnecting holes may be drilled between various members in order that the liquid will circulate. The presence of the hot material in each member may be checked by noting the increase in temperature of the member. Parts that are immersed shall be manipulated to ensure the absence of air pockets and shall remain in the bath until all bubbling has ceased. The members shall be thoroughly drained after treatment, and all access holes drilled in the members shall be closed with cadmium or zinc plated, self-tapping screws. The exterior surface of the assemblies shall be completely free of oil prior to application of the prescribed finish system.

3.6.13.3 Structural aluminum-alloy tubing. Interior surfaces of structural aluminum-alloy tubing shall be protected in accordance with Tables I, II and 3.4.1.1 for interior surfaces of the weapons system, insofar as practicable. The interior surfaces of structural aluminum-alloy tubing closed by welding shall be coated with primer or corrosion-preventive compound conforming to MIL-C-16173, Grade 2, applied through appropriately drilled holes.

3.6.13.4 Structural magnesium tubing. The use of magnesium alloy for structural tubing is prohibited.

3.6.13.5 Structural copper alloy, corrosion-resistant alloy and heat-resistant alloy tubing. Interior and exterior surfaces of structural copper alloy, titanium alloy, corrosion-resistant alloy, and heat-resistant alloy tubing need not be painted, except as required for dissimilar metal contact.

3.6.13.6 Mechanical attachment. Tubular parts which have fittings mechanically attached shall have all edges of the attachment sealed with a sealant conforming to MIL-S-81733, MIL-S-8802, or MIL-S-83430.

3.6.14 Attaching parts and fasteners.

3.6.14.1 General finish. Attaching parts and fasteners, such as screws, nuts, bolts, busnings, spacers, washers, rivets, high-shear rivets, self-tapping screws, sleeves for "shakeproof" fastener studs, self-locking nuts, "speed nuts", and clamps, need not be painted in detail, except when dissimilar metals are involved in the materials being joined together. Attaching parts or the surfaces with which they are in contact shall receive a coat of primer or sealant which shall be wet at the time of installation. Wet primer or sealant shall not be applied to the threaded portions of structural fasteners for which torque requirements are established without the coating. All steel, cadmium plated, and non-aluminum fasteners, installed in aluminum structures, shall be overcoated with MIL-S-81733, MIL-S-8802, or MIL-S-83430 sealant. The dry-film thickness of the sealant shall be a minimum of 5 mils. For magnesium dissimilar metal combinations, the general requirements of 3.6.3 shall apply.

3.6.14.2 Close tolerance bolts. Close tolerance bolts shall be coated with wet MIL-P-23377 primer or wet MIL-S-81733, MIL-S-8802, or MIL-S-83430 sealant prior to installation.

3.6.14.3 Adjustable parts. Threads of adjustable parts, such as tie rods and turnbuckles, shall be lubricated and protected, both before and after assembly, with antiseize compound conforming to MIL-T-83483, or protected with corrosion-preventive compound conforming to MIL-C-16173, Grade 2.

3.6.14.4 Touch-up. All attaching parts shall receive final finishing after installation. Topcoats shall be applied over the primer to match the color of adjacent exterior surfaces when necessary. Nuts and heads of bolts in joints that are subsequently lubricated need not receive final finishing.

3.6.14.5 Washers. Aluminum alloy (5356 or 5052) washers of suitable design shall be used under machine screws, countersunk fasteners, boltheads and nuts that would otherwise contact magnesium.

3.6.15 Areas subjected to corrosive fluids. Battery compartments constructed of leakproof and corrosion resistant materials conforming to MIL-R-46068 polyester resin and MIL-M-43248 glass fibers or equivalent, require no further finishing. All other battery compartments and adjacent areas which are subject to vapors and spills shall be coated with a suitable polyurethane casting resin acceptable to the acquiring activity. All surfaces within 24 inches of urinals and beneath lavoratories and galleys shall be

finished with a minimum of 0.002 inch of polysulfide primer conforming to MIL-P-87112 or with 0.009 inch of MIL-P-23377 and overcoated with polyurethane conforming to MIL-C-83286 in accordance with Table II and 3.4.1.1 for exterior surfaces. Bilge areas of aircraft shall be coated in accordance with Tables I and II using materials specified in Table II and 3.4.1.1 for exterior surfaces.

3.6.16 Fastenings and strut ends on seaplanes. All fastenings, strut ends, and other similar parts of seaplanes exposed to the action of sea water or salt spray shall receive additional protection in the form of a coat of material conforming to MIL-C-16173, Grade 1. Subsequent to painting, all open-ended struts shall be coated by dipping in material conforming to MIL-C-16173, Grade 1, followed by draining and wiping the exterior surfaces prior to installation. If it is not possible to coat parts completely by dipping, brush or spray application is permissible to obtain complete coverage.

3.6.17 Float bumpers. The forward face of the float or hull under the bumper pad and all parts of the bumper shall receive a coat of material conforming to MIL-C-16173, Grade 1, in addition to the protection required by Table II and 3.4.1.1.

3.6.18 Electrical parts.

3.6.18.1 Connections. The exterior of electrical bonding and ground connections conforming to MIL-B-5087 shall be finished in accordance with Table II after installation. All permanent electrical bonds, such as jumpers and ground studs, shall be sealed after installation with sealant conforming to MIL-S-81733, MIL-S-8802, or MIL-S-83430.

3.6.18.2 Conduit and boxes. Electrical conduit and junction or relay boxes shall receive protection in accordance with Table II and 3.4.1.1. Plastic coated and braided wire shall not be coated.

3.6.19 Surfaces and components exposed to high temperatures. Areas and components fabricated of magnesium and corrosion-resistant steel that are exposed to temperatures exceeding 149°C (300°F), but not above 204°C (400°F), either on the ground or in flight (other than instantaneous effects), shall be finished in accordance with Table II and 3.4.1.1 in the appropriate color and gloss. From 204° to 260°C (400° to 500°F), silicone finish systems shall be applied directly on surface-treated metal, omitting the wash primer and primer. Unless otherwise authorized by the acquiring activity, the color shall conform to the color scheme for the weapons system. Above 260°C (500°F), heat-resistant finishes conforming to TT-P-28 may be used; however, each application must be approved by the acquiring activity. Where use of MIL-S-81733 or MIL-S-8802 sealant has been specified or permitted herein, and exposure to operational temperatures above 121°C (250°F) is predicted, a high-temperature resistant sealant conforming to MIL-S-83430 (up to 350°F) or other material approved by the acquiring activity shall be used. Use MIL-A-46146 sealant at temperatures up to 232°C (450°F).

3.6.19.1 Fire insulating paint for Naval aircraft. Within power-plant compartments of Naval aircraft and other compartments normally operating at temperatures below 149°C (300°F), where fires are likely to occur as a result of flammable fluid leakage, and in areas adjacent to bleed air ducts, valves, etc., which contain air at temperatures above 149°C (300°F), all fluid

containers (such as air bottles, oxygen containers, hydraulic reservoirs, accumulators, and cylinders which could escalate intensity of a fire by explosion due to excessive heat) shall be protected by a paint-finish system consisting of at least 0.006 inch of MIL-P-23377 epoxy primer plus a minimum of 0.020 inch dry film thickness of MIL-C-46081 thermal insulating paint (normal interior finish requirements apply).

3.6.19.2 Coatings for temperature control. Surfaces subject to heating due to radiation from adjacent hot components or from exposure to a thermal pulse shall be finished with low-absorption coatings. Each proposed use of coatings for control of temperature shall be submitted to the acquiring activity for approval. The request for approval shall include all necessary technical information concerning the proposed material and application, with data supporting the effectiveness of the coating system.

3.6.20 Hull and float bottoms. Flying-boat hull bottoms and float bottoms shall be afforded a finish to provide protection, in accordance with Table II, to resist the erosive effects of high water speeds, and shall be aerodynamically smooth. Use of rubber grommets under the head of rivets, bolts, and screws on the exterior skin is prohibited. Where antifouling paint is prescribed, the finish shall be approved in each instance by the acquiring activity.

3.6.21 Wood. Wood and phenolic surfaces shall be finished with a minimum of two coats of varnish or enamel, plus an additional two coats, if in contact with metal surfaces or in exterior locations, as specified in MIL-STD-171.

3.6.22 Molded plastic and ceramics. Transparent plastic parts shall not be painted. Other plastic parts (except fiberglass laminates, antenna and magnetic airborne detector housing and radomes) need not be painted, except for color matching purposes. Under no circumstances shall plastic or ceramic insulators for radio antenna, etc., be painted, except that edges shall be sealed with material conforming to MIL-S-8802, MIL-S-81733, or MIL-S-83430 after installation in exterior locations.

3.6.23 Finishing of ducts. Interior surfaces of aluminum alloy heating or cooling ducts need not be painted, if such surfaces have been anodized and sealed. Aluminum alloy duct materials which are treated in accordance with MIL-C-5541 shall be painted as required for interior surfaces. Insulated ducting, regardless of composition, shall be painted in accordance with temperature requirements on exterior surfaces prior to application of the insulation with a primer suitable for the temperature to be encountered. Titanium and Inconel alloys do not require painting.

3.6.24 Reinforced plastic components. Plastic parts reinforced with fibers shall be suitably finished with approved coatings for protection against erosion. Leading edges of fiber-reinforced plastic radomes, antenna and magnetic airborne detector housings, etc., exposed to the air stream, shall be finished with a rain-erosion-resistant system, as specified by MIL-R-7705, except that MIL-C-83231, MIL-C-83445, or MIL-C-85322 1/ rain-erosion-resistant finishes or other finish approved by the acquiring activity shall be employed. Other methods of protection such as a boot of suitable erosion-and temperature-resistant material may be used upon approval of the acquiring activity. In exterior locations, edges shall be sealed with sealant material conforming to MIL-S-81733, MIL-S-8802, or MIL-S-83430. No

portion of transparent components, whether glass or plastic, shall be painted. Plastic parts and surfaces, other than those described above, may be painted for color-matching purposes.

1/ MIL-C-85322 requires the use of MIL-C-8514 wash primer.

3.6.25 Metal leading edges. Metal leading edges exposed to speeds in excess of 500 knots shall be finished in accordance with MIL-F-18264 with rain-erosion-resistant coatings. Exterior surfaces shall be aerodynamically smooth.

3.6.26 Helicopter rotor-blade leading edges. The finish used on helicopter rotor blade leading edges shall prevent deterioration of the underlying surfaces, and shall be resistant to erosion from rain, sand particles, seaspray, etc., unless the edges are made of corrosion-and erosion-resistant material; e.g., nickel-plated stainless steel. Design information and finish proposals shall be submitted to the acquiring activity for approval.

3.6.27 Rubber (natural and synthetic). Natural and synthetic rubber shall not be painted, greased, or oiled.

3.7 Requirements for color, insignia and markings.

3.7.1 Exterior color. The exterior color of the weapons system shall be as specified in specifications issued by the acquiring activity: MIL-C-18263 for the Department of the Navy; MIL-M-25047 for the Department of the Air Force; and Publication TB-746-93-2 for the Department of the Army.

3.7.2 Interior color. The interior color of the weapons system shall be as specified in MIL-C-8779 for Navy and Air Force weapons systems, and as specified in TB-746-93-2 for Army systems.

3.7.3 Insignia and markings. Insignias and markings shall be applied in accordance with specifications issued by the acquiring activity: MIL-I-18464 for the Department of the Navy; MIL-M-25047 for the Department of the Air Force; and Publication TB-746-93-2 for the Department of the Army. All insignias and markings shall be applied over completed exterior surfaces.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, 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 specifications where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Inspection tests. All coatings and finishes shall be inspected in order to insure conformance to the requirements of this specification. When inspection is performed at the contractor's plant, all inspections and tests shall be conducted by the contractor, and the results thereof shall be retained for review as required by the acquiring activity.

4.2 Previous approval. Acceptance or approval of material during the course of manufacture and the approval of the contractor's finish specification or finish schemes does not guarantee acceptance of the finished product.

4.3 Rejection and retest. Coatings and finishes not conforming to the requirements of this specification shall be rejected. Coatings and finishes may be reworked or replaced to correct the defects, and resubmitted for acceptance. Full particulars concerning previous rejection and the action taken to correct the defects found originally shall be furnished to the acquiring activity.

5. PACKAGING (NOT APPLICABLE)

6. NOTES

6.1 Intended use. This specification covers the methods and materials used for protective surface treatment and the application of such finishes and protective coatings to weapons system parts, including spares, and assemblies such as fuselages, wings, cowls, strut empennage, rotor blades, and floats. This specification, unless specifically referenced in the item specification or drawing does not apply to equipment such as propellers, power plants, and instruments; nor to standard contractor purchased accessories such as electric motors, generators, switches, hydraulic valves, and similar parts.

6.2 Definitions. For the purpose of this specification, the following definitions apply:

6.2.1 Seaplanes. All aircraft operating wholly or in part from water, such as flying boats, airplanes with float-type alighting gear, aircraft with hydro-skis, amphibians, or convertibles, are considered to be "seaplanes".

6.2.2 Hull bottom. The "hull bottom" is that surface area of a seaplane fuselage below a line 12 inches above the full-load water line.

6.2.3 Exterior surfaces. All surfaces of a weapons system normally exposed to external environment during flight or on the ground and all interior surfaces which may be wetted with water or any other corrosive fluids shall be considered exterior surfaces. These surfaces include wheels and gear, wheel wells and their fairings, dive brakes, wing flaps, wing-fold areas, battery compartment, bilge area on aircraft with latrines, and any compartment cooled by RAM air.

6.2.4 Faying surface. The term "faying surface" is a surface of a member in contact with another to which it is joined.

6.2.5 Weapons system. The term "weapons system" herein includes all types of aircraft and missiles.

6.3 Finish systems. Finish systems shall not be used on bearing or sliding surfaces, nor shall be required on areas where they could be rubbed or scraped onto surfaces which must be clean and bare for proper function.

6.4 Publications. Because of the general nature of its requirements, and because it is superseded for the contract by the contractor-prepared specification for the particular weapons system, copies of this specification will not ordinarily be distributed to subcontractors. It is the responsibility of the prime contractor to transmit to each subcontractor such details of finishing procedure as are applicable to his work.

6.5 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodians:
Army - MR
Navy - AS
Air Force - 20

Reviewer activities:
Army - AR, AV, MI
Navy - OS
Air Force - 99

Preparing activity:
Navy - AS

(Project MFFP-0218)

TABLE I. Primer-topcoat system compatibility.

	Topcoats			
Primers	MIL-C-22750	MIL-C-46168	MIL-C-83286	MIL-C-85285
MIL-P-23377	X	X	X	X
MIL-P-52192		X		
MIL-P-85582	X	X	X	X

TABLE II. Protective finish system requirements.

Item	Material	Minimum applied dry film thickness, mils			
		Primer		Topcoat	
		Exterior	Interior	Exterior	Interior
1	All 1000, 3000, 5000 and 6000 series aluminum alloys and all clad 2000 and 7000 series alloys except bottoms, and interior trailing edge control surfaces, for which item 8 applies	0.6	1.2	1.8	-
2	All nonclad aluminum alloys in the 2000 and 7000 series, and other high-strength aluminum alloys including casting alloys	0.9	1.5	1.8	-
3.	Sacrificial metal coatings and nonsacrificial applied to non-corrosion resistant metals	0.6	1.2	1.8	-
4.	Titanium, alloys 1/	-	-	-	-
5.	Magnesium alloys	1.2	1.5	1.8	1.8
6.	Armor plate - ferrous	0.6	1.2	1.8	-
7.	Corrosion resistant alloys	0.6	1.2	1.8	-
8.	All metals not covered by above	0.9	1.5	1.8	-
9.	Organic matrix composites	0.9	1.2 2/	1.8	-

1/ These metals do not require primer or topcoats for corrosion protection except for faying surfaces as noted in 3.6.2 and 3.6.3. Primer and topcoats may be applied to blend with adjacent areas (use item 3 requirements).

2/ Application of primer on interior surfaces is only required at dissimilar metal interfaces (see 3.6.3c).