

NAVAL AIR ENGINEERING CENTER
PHILADELPHIA, PENNSYLVANIA 19112
AERONAUTICAL MATERIALS LABORATORY
CHEMICAL ENGINEERING DIVISION

DATE 6 May 1966

REPORT NO. NAEC AML 2446

Development of Oil and Fuel Resistant
Removable Camouflage Coatings

PAN 13-9 UNDER BUWEPS WEPTASK
RRMA 03 013/200 1/FO20 03 01

A. Objective:

1. The objective of this investigation was to provide technical data for the procurement of the subject coatings in the Field Green, Medium Green, Shadow Green, Desert Drab, and Seaplane Gray colors. These coatings were to be designed so that they could be used over existing aircraft finishes and removed without damage to the latter.

B. Materials:

1. The pigments used are as generally listed in Specification MIL-P-6884. The vehicle for all coatings was acrylic resin, Acryloid B44 (40% solids in toluene), manufactured by the Rohm and Haas Company.

C. Experimental Procedures:

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C. Experimental Procedures:

1. The AML 2C removable black camouflage coating, which was recommended for service tests as a promising material, was employed as the compositional prototype for the subject coatings, as may be seen by inspection of the formulation data listed in Table 1.

2. All coatings were formulated by grinding in porcelaine or steel ball mills. They were then tested for satisfactory spray-out, fineness of grind, solids content, gloss, and other tests necessary for the assurance of a quality coating material. These tests are listed in Table 1.

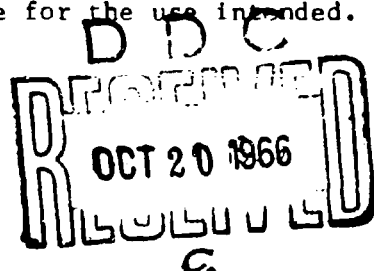
D. Results:

1. All of the coatings exhibited satisfactory coating and removal properties and resistance to commonly used aircraft fuels and oils, including the new MIL-L-23699A lubricating oil.

E. Conclusions:

1. All of the coatings appear to be suitable for the use intended.

ENCLOSURE (1)
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F. Recommendation:

1. Accordingly, it is recommended that current procurements of the subject coatings be made from the proposed procurement document of Table 1.

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Table 1 - Part A - Formulation Data and Proposed Procurement Document

Part B - Can Label Instructions

NOTES FOR ALL COLORS

1. For colors 26081, 34092, 34097, 30219; other durable tinting pigments not listed may be utilized up to 2% of the total pigment content for color matching purposes. Tinting pigments are not permitted for 627 Field Green.

2. The formulations listed for the #595 colors are to be considered as suggested formulations; hence, the alternative pigments listed under each formulation. These suggested formulations are only approximations and will vary with tinting strength of pigments, etc.

FORMULATION DATA AND PROPOSED PROCUREMENT DOCUMENTDesert Drab, Federal Standard 595 Color 30219Part I - Formulation

<u>Ingredients</u>	<u>Source</u>	<u>%</u>
TiO ₂	DuPont, R610	9.00
XY Ochre	Imperial Color Co.	10.00
Indian Red	Imperial Color Co., 1206	2.00
Chrome Green Oxide	Imperial Color Co., X1134	4.00
Silica	Johns-Manville Co. (Celite #266)	8.33
Magnesium Silicate	Whitaker, Clarke, & Daniels Co. (SF Talc #399)	16.67
Non-volatile Vehicle (Acryloid B44)	Rohm & Haas Company	50.00

Part II - Requirements

% Pigment of Total Non-volatile	52% max.
Fineness of Grind	5 min.
60° Gloss	5 max.
Hiding	98% min.
Total Non-volatile	48% min.
% Prime Pigment of Total Pigment	49% min.
% Superfine Talc of Total Extender	63% min.
Vehicle-Acryloid B44	40% in toluene - Rohm & Haas
Permissible Solvent	Toluene

Prime Pigments - TiO₂, yellow iron oxide, red iron oxide, ochre chrome green oxide, chrome green, carbon black, medium chrome yellow, chrome orange, lamp black. The extender shall be equivalent to SF Talc #399 and Celite #266 respectively.

Shadow Green, Federal Standard 595 Color 34079Part I - Formulation

<u>Ingredients</u>	<u>Source</u>	<u>%</u>
XY Ochre	Imperial Color Co.	9.00
Chrome Green Oxide	Imperial Color Co., X1134	7.50
Carbon Black		1.00
TiO ₂	DuPont, R610	7.50
Silica	Johns-Manville Co. (Celite #266)	8.33
Magnesium Silicate	Whitaker, Clarke, & Daniels Co. (SF Talc 399)	16.67
Non-volatile Vehicle (Acryloid B44)	Rohm and Haas Company	50.00

PART II - Requirements

% Pigment to Total Non-volatile	52% max.
Fineness of Grind	5 min.
60° Gloss	5 max.
Hiding	98% min.
Total Non-volatile	48% min.
% Prime Pigment of Total Pigment	49% min.
% Superfine Talc of Total Extender	63% min.
Vehicle Acryloid B44	40% in toluene - Rohm & Haas
Permissible Solvent	Toluene

Prime Pigments - Chrome yellow, chrome orange, TiO₂, yellow iron oxide, ochre, chrome oxide green, chrome green, indian red, molybdate orange, phthalocyanine blue, carbon black, lamp black. The extender shall be equivalent to SF Talc #399 and Celite #266 respectively.

Medium Green, Federal Standard 595 Color 34092Part I - Formulation

<u>Ingredients</u>	<u>Source</u>	<u>%</u>
Carbon Black		.50
Chrome Green Oxide	Imperial Color Co., X1134	14.25
TiO ₂	DuPont, R61G	10.00
Phthalocyanine Blue	Imperial Color Co., X3210	.25
Silica	Johns-Manville Co. (Celite #266)	8.33
Magnesium Silicate	Whitaker, Clarke, & Daniels Co. (SF Talc #399)	16.67
Non-volatile Vehicle (Acryloid B44)	Rohm and Haas Company	50.00

Part II - Requirements

% Pigment to Total Non-volatile	52% max.
Fineness of Grind	5 min.
60° Gloss	5 max.
Hiding	98% min.
Total Non-volatile	48% min.
% Prime Pigment of Total Pigment	49% min.
% Superfine Talc of Total Extender	63% min.
Vehicle Acryloid B44	40% in toluene - Rohm & Haas
Permissible Solvent	Toluene

Prime Pigments - Chrome green oxide, TiO₂, carbon black, indian red, phthalocyanine blue, medium chrome yellow, yellow iron oxide, chrome orange, molybdate orange, chrome green, lamp black. The extender shall be equivalent to SF Talc #399 and Celite #266 respectively.

Seaplane Gray, Federal Standard 595 Color 26081Part I - Formulation

<u>Ingredients</u>	<u>Source</u>	<u>Parts by Weight</u>
TiO ₂	DuPont, R610	140
Yellow Iron Oxide	C. K. Williams Co. (3087)	45
Carbon Black		17
Magnesium Silicate	Whitaker, Clarke, & Daniels Co. (SF Talc #399)	150
Acryloid B44 (40% in toluene)	Rohm and Haas Company	1490
Toluene	TT-T-548	200

Grind in steel ball mill for 48 hours

Part II - Requirements

Finess of Grind	5 min.
60° Gloss	15-30
Hiding	98% min.
Total Solids	45% min.

Permissible Pigments - TiO₂, carbon black or lamp black, yellow iron oxide equivalent to above.

Field Green, ANA Color No. 627Part I - Formulation

<u>Ingredients</u>	<u>Source</u>	<u>Parts by Weight</u>
Medium Chrome Yellow	Imperial Color Co., X1810	138
Phthalocyanine Blue	DuPont BT 284D	7
Antimony Sulfide Precipitated grade, MIL-A-15197(SHIPS)	Rare Metals Products Co.	55
Silica	Johns-Manville Co. (Celite #266)	70
Magnesium Silicate	Whitaker, Clarke, & Daniels Co. (SF Talc #399)	130
Acryloid B44	Rohm and Haas Company	1000
Toluene	TT-T-548	200

Grind in white pebble mill for 48 hours

Part II - Requirements

Finess of Grind	5 min.
% Pigment of Total Non-volatile	52% max.
60° Gloss	5 max.
Hiding	98% min.
Total Extender	48% min.
% Pigment of Total Pigment	49% min.
% Superfine Talc of Total Extender	63% min.
Vehicle -Acryloid B44	40% toluene - Rohm & Haas
Permissible Solvent	Toluene

NOTE: Equivalent pigment and extender may be used. The color shall fall between the limits of the curve in Figure 1 of MIL-L-19538. Use clean mill. Carbon black etc. will destroy infrared reflectance.

CAN LABEL INSTRUCTIONS

A. Description of Camouflage Coating - This coating is designed for spray use directly over lacquer or epoxy paint coatings which are already on the aircraft. The coating may be removed from the existing paint scheme without harm to the scheme, by using the special remover as described below.

B. Preparation of Existing Weathered Paint Scheme (Lacquer or Epoxy) Prior to Application of Camouflage Coating - Clean and follow by very thorough wet sanding (water) with #400 Wetodry paper. Clean off dust produced by sanding. Emphasis is placed on thorough sanding in order to achieve satisfactory adhesion of the subsequently applied camouflage paint.

C. Preparation of Existing Fresh Paint Scheme (Lacquer or Epoxy) Prior to Application of Camouflage Coating - Sanding is not required, merely overcoat.

D. Reduction for Spray - All camouflage coatings are to be reduced approximately one part paint to one part toluene by volume. If increased flow is desired, add xylene to the toluene reducer.

E. Application - Apply in two spray passes, 10 minutes between passes, to a total dry film thickness of 1.2 ± 0.2 mil.

F. Removal of Camouflage Coatings - Remove with fresh MIL-R-21972 remover. Permit remover to remain in contact with coating for at least $\frac{1}{2}$ hour in a shaded area. Work remover with fiber bristle brush. Reapply remover if necessary. Flush with water. Repeat procedure if necessary. If small discolored areas are present, remove with rags wet with toluene or xylene. Note remover and solvents are flammable. Ground aircraft and take necessary precautions not to use metallic material or shoes which can spark.