

April 8, 1941

TECHNICAL ORDER  
NO. 07-1-1

DOPE, PAINTS, AND RELATED MATERIALS

GENERAL - AIRCRAFT MARKINGS, INSIGNIA AND CAMOUFLAGE

This Technical Order replaces Technical Order 07-1-1 dated May 15, 1940, and all previous instructions on airplane camouflage in conflict herewith.

NOTE: The camouflaging of airplanes directed herein will be accomplished as soon as practicable by Service Activities having the necessary equipment, or if necessary, at Depots as arranged with the Control Depot.

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1. CAMOUFLAGING OF AIRPLANES.

a. Types of Airplanes to be Camouflaged: All U.S. Army Air Corps and Federalized National Guard airplanes will be camouflaged in accordance with A.C. Specification No. 24114, with the following exceptions:

(1) Training types of airplanes.

(2) Airplanes of other types regularly used for training purposes by Training Centers.

(3) Airplanes operating in the Alaskan Department or in any country having similar climatic and terrain conditions. (See paragraph 4.)

b. Application of Camouflage materials over existing protective coatings: Specification camouflage materials in kind can be satisfactorily applied over existing protective coating on airplanes, that is, specification camouflage lacquer over existing lacquer finishes, specification camouflage enamel over existing enamel finishes and specification camouflage dope over existing doped finishes.

c. Appearance of camouflaged airplanes: Due to the highly pigmented content and dull finish of camouflage materials, camouflaged airplanes will not present as pleasing an appearance as the highly polished alclad or glossy painted airplanes of the past. No attempt should be made to assure a polish or high gloss as this will tend to defeat the purpose of the camouflage.

d. Maintenance of camouflage surfaces: Camouflage materials may have neither the adhesive nor the color fast quality of specification paint materials used heretofore. It is anticipated that there will be minor chipping of the camouflage materials at the leading edges of airfoils, particularly if the airplane is flown through heavy rains. This chipping may be somewhat unsightly, but as long as the material affords a reasonable coverage of the surface, the finish should not be touched up, as the chipping effect is not objectionable from a camouflage standpoint and the additional weight derived through the continued touching-up process might become objectionable.

e. Types of camouflage materials: Paragraph E-1b of A.C. Specification 24114 permits the use of two types of camouflage materials on metal surfaces. Either of these types may be used, subject to provisions of sub Para. b. It will be noted that the use of Enamel, camouflage, Specification 14109 on metal surfaces requires the use of but one (1) coat of enamel and that no primer coat is necessary. Results of tests indicate that the least effort that is made toward exactness in the application of camouflage materials, other than the satisfactory spraying on of the prescribed number of coats, offers the best results from the standpoint of camouflage value.

f. Use of special color of camouflage material: The basic color of camouflage material for the top surfaces of all camouflaged airplanes will be Dark Olive Drab, Shade No. 41, A.C. Bulletin No. 41. However, to meet requirements where airplanes are operated over a terrain which is predominately green, the use of one coat of Medium Green, Shade No. 42, A.C. Bulletin No. 41, is authorized to supplement the top surface camouflage finish.

g. Identification Markings:

(1) All identification markings, insignia, designators and squadron and flight command stripes on camouflaged airplanes will be of specification camouflage materials and of colors conforming to the color shades outlined in A.C. Bulletin No. 41.

(2) Airplane designators for camouflaged airplanes:

(a) The designator used on the wings will be as specified in Paragraph 8 b, with the location and size as specified in paragraph 8 c. Insignia blue, shade No. 47 camouflage material will be used.

(b) The designator used on the vertical stabilizer and rudder will be as specified in paragraph 8 b, with the location and size as specified in paragraph 8 c. Black, shade No. 44 camouflage material will be used.



(c) Other identification markings, insignia, and organization identification will be as specified in paragraphs 5, 6, 7, and 8.

h. Camouflaging of Propeller: The camouflaging of propellers as required in Paragraph "F" of A.C. Specification No. 24114 should be accomplished by spraying each propeller blade in the horizontal position and retaining the propeller in this position until the camouflaging materials have set, after which it will be necessary that the propeller be checked for balance. Tests indicate that one (1) coat of camouflage materials on propeller blades offers adequate coverage. It is anticipated that this finish on propeller blades will chip and become unsightly after a period of use, however, no attempt should be made to touch up the surface of the propeller blades at any time until the propeller is overhauled, at which time the assembly will be repainted and balanced.

i. Because of the magnitude of the work involved, and the emergency conditions now existing, all service activities will make every effort, before contacting the depots, to accomplish the camouflage work specified herein with equipment and facilities already on hand or that can be made available locally. When climatic conditions permit, the work may be accomplished out of doors, or in the lee of hangars or other buildings when partial protection from excessive wind is necessary. It should be borne in mind that essentially all paints, dopes and lacquers are of a toxic nature and inflammable; according precautionary measures should be exercised in handling and application.

## 2. COLOR FOR TRAINING AIRPLANES

a. Advanced Trainers: Aluminized finish except all-metal types, which will be natural metal finish.

b. Primary and Basic Trainers: Yellow and blue as required by specification No. 98-24113.

## 3. IDENTIFICATION NUMERALS FOR TRAINING AIRPLANES

a. The use of field numbers and the painting of ring cowls (or combination thereof) for identification purposes of Training airplanes at activities of the various Army A.C. Training Centers and Civil Flying Schools is authorized. Designation of these identification numbers and ring cowl numbers for activities within each Training Center will be the responsibility of the respective Commanding General thereof. The identification numbers will be of a contrasting color, preferably block type, and will be applied to each side of the fuselage approximately midway between the vertical projections of the trailing edge of the wing and the leading edge of the horizontal stabilizers. The height of the identification numerals will be approximately three fourths of the projected height of the fuselage at that location.

4. COLORS FOR USE ON AIRPLANES IN ALASKAN DEPT. OR COUNTRIES HAVING SIMILAR CLIMATIC AND TERRAIN CONDITIONS.

a. To provide a color scheme offering marked contrast for spotting forced landings, etc. for airplanes operating in Alaska or in countries where like conditions prevail, the use on the top and bottom surfaces of wings of camouflage materials, of the shades covered in A.C. Bulletin No. 41, to best meet the conditions of local terrain color is authorized. Since the distribution of airplanes is not known at the time the respective manufacturers are camouflaging the finished airplanes, airplanes will necessarily be furnished with camouflage in accordance with A.C. Specification No. 24114. It will therefore be necessary to apply any special colors where such special distinguishing colors are authorized. It will not be necessary to remove the original camouflage coating to apply the special colors. However, lacquer camouflage material cannot be applied over a previous coating of enamel camouflage material.

b. When tactical requirements demand, airplanes operated in these locations will be maintained in a camouflaged condition as follows:

(1) Lower surfaces will be camouflaged as prescribed in A.C. Spec. 24114.

(2) Upper surfaces will be camouflaged with such shades of specified material as best blends with the local terrain.

5. MARKINGS. - a. Each airplane and each lighter-than-aircraft will be marked in accordance with Specifications Nos. 98-24105 and 99-2050, respectively.

b. The code markings specified therein are the means by which the number, identity, and age of protective coatings of the airfoils, fuselage, etc., and other pertinent data relating to the aircraft, are determined. Therefore, in no instance will such marks be omitted or placed where they can not readily be seen when the aircraft is completely assembled.

c. Markings required by specifications will neither be altered nor effaced, except as required by repairs or refinishing operations, in which case the markings will be properly replaced, nor will they be transferred from locations designated in specifications.

d. There being no military reason for the use of individual names, the practice of naming airplanes after states, municipalities, or other localities will be discontinued. However, each airplane will have the name of the home station, in a contrasting color, placed on the left side of the fuselage immediately above the technical data legend using letters approximately one inch high.

6. STANDARD INSIGNIA. - Air Corps standard insignia will be placed and maintained on each aircraft, as prescribed in Specification No. 98-24102, or Specification No. 24114 (camouflaged airplanes).

7. ORGANIZATION INSIGNIA. - a. Definition. - Organization insignia are those designs, markings, etc., that have been approved by the War Department for use by an individual organization.



**b. Rules governing Design.** - The following rules govern the designs of Air Corps organization insignia:

(1) They will be simple and, when practicable, will depict some historical significance associated with the organization.

(2) They will be dignified and in good taste. Fantastic designs may be characteristic and "funny" but have no permanent value.

(3) Each design will possess the clearness required to make it distinguishable at a distance at least 150 yards.

(4) They will not contain --

Numerals

The letters "U.S."

The Air Corps insignia

The United States flag

The United States coat of arms or any part of it

The complete coat of arms of any state or country, although devices may be taken from them when applicable

Outlines of geographical maps

Foreign decorations (e.g., Croix de Guerre, Fourragere)

Campaign ribbons

**c. Submitting Samples for Approval.** - Before placing a new design on equipment, three 8 by 10-1/2 inch sample copies will be prepared in the desired colors on good quality paper and submitted, for approval, to the Adjutant General through the Chief of the Air Corps. The samples will be colored with water colors or wax crayons in the colors intended for the insignia when placed on the aircraft. Blends of colors may be used when essential, but much better results are obtained when blends are not employed, as it is difficult to match or keep them uniform in shade or tint in each of the paintings on the several aircraft. The "poster" type of design and "block" coloring are recommended. A brief outline of the historical development or significance of the design will accompany the sample copies when submitted for approval. No variation from an approved design will be permitted without authority from the Adjutant General.

**d. Rules Governing Use.** - The following rules govern the use of organization insignia on aircraft:

(1) Each aircraft assigned to a permanent organization, including U.S. Army A.C. schools, but not including Civil Flying Schools under contract, will bear the insignia of that organization. For example:

Aircraft assigned to a squadron will bear the insignia of that squadron.

Aircraft assigned to headquarters of groups, wings, etc., will bear the insignia of such headquarters.

(2) No aircraft will bear organization insignia other than that of one organization.

(3) The placing of organization insignia on aircraft will be a responsibility of the organization to which the insignia pertain. Depots will not be required to reproduce insignia or other markings peculiar to an individual organization.

e. Location, Size, and Application for Airplanes. -

(1) It is impossible to specify a standard location for organization insignia on all airplanes; therefore, no specific locations are mandatory. However, the sides of the fuselage midway between the wings and tail surfaces are the most desirable and should be used whenever conditions permit, so that the insignia on the majority of airplanes will be in the same relative location. The spaces selected on the two sides of the fuselage should be as nearly as possible opposite each other, and should have smooth surfaces unbroken by fittings, lacing, fasteners, steps, joints, openings, etc. When avoidable, insignia will not be placed on cowling.

(2) In no instance will the size of an insignia exceed three-fourths of the depth of the fuselage at the point at which the insignia is applied. Otherwise, the size will be governed by the most suitable spaces available, provided that such spaces are not too small or unfavorable for other reasons. If the available spaces are too small to provide visibility, as described in paragraph 7 b (3), or if unsuitable due to fittings, lacings, fasteners, etc., or corrugated metal, each insignia may be painted on a sheet of aluminum or suitable alloy of the desired shape and area and not more than 1/32-inch thick. All sharp corners and edges of such sheets will be rounded off. The sheets will then be secured to the sides of the airplane with screws, washers, and nuts, or by other suitable means, in a manner permitting ready removal when necessary. Each sheet will be secured at a sufficient number of points to prevent its being torn off in flight, and to prevent vibration that would cause it to crack or to wear the fabric or other parts. Whenever practicable, it will be secured to rigid members of the airplane. When necessary to attach such a sheet to fabric, the fabric will be adequately reinforced with tape securely attached by doping, and, if required, by stitching. In addition, suitable reinforcing strips of sheet metal or wood will be used next to the inside face of the fabric to receive the inside ends of the screws or other securing parts. Insignia on like models of airplanes in the same organization should be uniform in size.

f. Location, Size, and Application for Lighter-than-Aircraft. -

(1) Organization insignia will be placed on each side of each lighter-than-aircraft. The locations for observation balloons will be on each side, halfway between the greatest diameter and the leading edges of the horizontal lobes. The locations for spherical balloons will be at points in line with and three feet from each end of the wording "U.S. Army."

(2) In no instance will the size of lighter-than-air insignia exceed nine square feet. The insignia placed on each craft assigned to an organization will be uniform in size. However, this does not require that insignia of different organizations be of the same size.



(3) The insignia for all lighter-than-aircraft will be painted on two-ply envelope fabric, Code No. 101, and securely attached to the envelope with rubber cement. Each sheet of fabric will be neatly trimmed to the minimum size required, and, to insure adhesion, corresponding areas of the aluminum finish will be carefully removed from the envelopes with suitable wire brushes.

g. Decalcomania Insignia. - Where personnel are not available to paint organization insignia in a satisfactory manner, the use of decalcomania insignia on airplanes is authorized. Owing to the local nature of their usage, however, it will be necessary for stations desiring to use these transfers to obtain them by local purchase. Their application does not require skilled workmen, and when coated with clear varnish after being applied, they are about as durable as the average painted design. The cost varies with:

- (1) Size
- (2) Design
- (3) The number ordered
- (4) The number of colors and to some extent the colors themselves

Instructions for applying decalcomania are furnished by the manufacturer. Until used, the transfers should be stored in a dry place where they will not be exposed to temperatures above normal.

8. ORGANIZATION IDENTIFICATION. - As a means of identifying airplanes, all airplanes will be marked as outlined herein. These markings (paragraphs 8, 9 and 10) are in addition to the standard markings, insignia, and technical data prescribed in paragraphs 5, 6, and 7, and will be applied by the organization to which the airplanes are assigned.

a. Squadron Recognition Colors. - A suitable depth of the front portion of engine nacelles will be painted as follows:

(1) Pursuit, Attack and Bombardment Squadrons. - The cowling will be painted one solid color: red, white, blue or yellow. The assignment of colors will be made by the group commander except where, as a citation for distinguished service, an individual squadron may be authorized by higher authority to use other recognition markings.

(2) Group Headquarters and Headquarters Squadrons.

(a) 3-Squadron Group. - The cowling to be divided by longitudinal lines into three equal segments; one segment to be painted red, one white, and one yellow.

(b) 4-Squadron Group. - The cowling to be divided by longitudinal lines into four equal segments; one segment to be painted red, one white, one yellow, and one blue.

(3) Reconnaissance Squadrons. - The color or color combinations for painting the cowling to be specified by wing commanders.

(4) Hq. Squadrons of Wings, Air Bases and G.H.Q. Air Force. No recognition colors to be employed.

b. Airplane Designators.

(1) Each airplane will have a distinctive designator assigned, which will consist of a combination of letters and numbers except airplanes on loan to civil flying schools engaged under contract to train student Army pilots. The system of assigning the designators will use first the wing, group, squadron, corps area, or other unit identifying number, wherever applicable. This number will be followed by a letter or letters designating the type of equipment, as "B" for bombardment, "P" for pursuit, etc., or if not applicable, the assignment of the airplane as "W" for wing, "AB" for air base, "OR" for organized reserve, "AD" for air depot, etc., followed by a number which will be assigned by group and station commanders or by higher authority to designate a particular airplane. The following outlines the lettering system to be used,

<u>Activity</u>	<u>Symbol</u>
Air Base	AB
Air Depot	AD
Air Officer	AØ
Bombardment Group	B
Communication Squadron	C
Headquarters	HQ
Instructor(miscellaneous)	IM
Materiel Division	MD
Miscellaneous	M
*National Guard	NG
Observation	Ø
Organized Reserve	ØR
Photo	PH
Pursuit Group	P
Reconnaissance	R
School	ED
Staff	S
Technical Supervisor	TS
Transport	T
Wing	W
Weather (Observation)	WØ

(2) The following are examples of complete designators:

<u>Activity</u>	<u>Designator</u>
Headquarters Squadron, GHQ Air Force	HQ1 to HQ -
Headquarters Squadron, 2nd Wing	2W1 " 2W -
5th Air Base Squadron	5AB1 " 5AB -
9th Bombardment Group	9B1 " 9B -



<u>Activity</u>	<u>Designator</u>
20th Pursuit Group	20P1 " 20P -
41st Reconnaissance Squadron	41R1 " 41R -
4th Composite Group	4MB1 " 4MB -
6th Transport Squadron	6 T1 " 6T -
Fairfield Air Depot	FAD1 " FAD -
Middletown Air Depot	MAD1 " MAD -
Southeast Air Depot	SEAD1" SEAD -
San Antonio Air Depot	SAAD1" SAAD -
Sacramento Air Depot	SAD1 " SAD -
Panama Air Depot	PAD1 " PAD -
Hawaiian Air Depot	HAD1 " HAD -
Phillippine Air Depot	PHAD1" PHAD -
2nd Corps Area Air Officer	2A01 " 2A0 -
1st Communications Squadron	1C1 " 1C -
National Guard Instructors	1M1 " 1M -
*154th National Guard Observation Squadron	54NG1" 54NG -
Materiel Division	MD1 " MD -
22nd Observation Squadron, Air Corps	2201 " 220 -
1st Photo Squadron	1PH1 " 1 PH -
8th Corps Area Organized Reserve	80R1 " 80R -
63rd School Squadron	63ED1" 63ED -
1st Staff Squadron	1S1 " 1S -
Technical Supervisor	TS1 " TS -
2nd Weather Observation Squadron	2W01 " 2W0 -
Miscellaneous	M1 " M -

\* NOTE: Not inducted into Federal Service - All National Guard Squadrons are Observation, and with the NG symbol used it is not necessary to add the 0 symbol. Since all National Guard units bear a squadron number between 100 to 199, the hundred designation will be dropped in the interest of brevity.

After induction into Federal Service - Federalized National Guard squadrons will use designators as specified for Air Corps Observation Squadrons, including the 0 symbol and the complete squadron number.

(3) In the case of a composite group, the airplane designator will consist of the group number, followed by the letter "M" for miscellaneous, a second letter to indicate the type of equipment, as "B" for bombardment, and the designating number of the particular airplane.

c. The letters and figures composing the airplane designators will be of the vertical block type, the width will be 2/3 of the height and the strokes will be approximately 1" wide for every 6" of height. The distance between the letters will be equal to 1/2 the width of a letter. In consideration of the varied sizes and configurations of airfoils and fuselages of A.C. airplanes, it is

impractical to specify a standard height of letters that will meet the requirements for all airplanes. In general, however, the height of the letters and figures will be as specified in the following paragraphs and uniformity should be maintained for airplanes of similar types at a station. The airplane designators will be painted on in a centrally located position in the following locations:

(1) For airplanes not camouflaged. - The designator will appear on each side of the vertical stabilizer. Where more than one vertical stabilizer is used, the designator will appear on the left exposed side of the left hand stabilizer and on the right exposed side of the right hand stabilizer. The lettering will appear in two lines with the individual airplane number on the top line, and the unit or organization designator on the bottom line and reading from left to right. For example, 12 indicating number "12" airplane of the 31st Pursuit Group.

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The letters and numbers will be of sufficient height as to make the designator readily discernable from a distance of approximately 150 yards.

(2) For camouflaged airplanes. - The designator will be as specified in paragraph 8 c (1) for uncamouflaged airplanes, except that the necessary area of both the vertical stabilizer and the rudder be utilized.

(3) On the upper and lower sides of the left wing only (upper side of the left upper wing and the lower side of the left lower wing in the case of a biplane). The lettering will appear all on one line, with the top of the letters toward the leading edge.

(a) The upper surface markings will be centered on a line at right angles to the longitudinal axis of the airplane, and passing through the center of the Air Corps insignia. The height of the letters will be 1/5 of the chord of the wing, as measured at a point 3/4 of the distance from the fuselage to the inner edge of the Air Corps insignia.

(b) The lower surface markings will be ahead of an parallel to the word "Army". The height of the letters will be 1/3 of that portion of the chord from the top of the letters composing the word "Army" to the center of the leading edge of the wing, as measured at a point 3/4 of the distance from the fuselage to the inner edge of the Air Corps insignia.

(4) In addition to the above, the airplane identification number (squadron, group or station) "12" in example cited in paragraph 4 c. (1), will be painted on the engine cowling, or on the forward portion of the fuselage, so as to be visible from the forward hemisphere. The variation in size and contour of the locations available for these identifying numbers will necessitate that the exact location and size of the numbers be determined locally for each model of airplane.

(5) The following colors will be used for these identifying markings:

(a) Black against a light background. In the case of camouflaged airplanes black, shade No. 44, A.C. Bulletin No. 41.



(b) Yellow (Shade No. 4 for uncamouflaged airplanes - Shade No. 48, A.C. Bulletin No. 41, for camouflaged airplanes) against a dark background.

9. **COMMAND RECOGNITION STRIPES.** - Command airplanes, except as noted in paragraph 9 c, will be identified by painted stripes 5 inches wide, encircling the fuselage immediately back of the rear cockpit. These stripes will be of the same color as the squadron identification color, except that black will be used instead of blue on blue or camouflaged fuselages, and instead of white on unfinished aluminum alloy fuselages. The number of stripes and their position on the fuselage will be as follows:

a. Squadron Command Airplanes. - Two stripes, five inches apart, encircling the fuselage in planes at right angles to the axis of the airplane.

b. Flight Command Airplanes. -

A Flight - One stripe encircling the fuselage in a plane at right angles to the axis of the airplane.

B Flight - One stripe encircling the fuselage at a 45° angle from the horizontal with the uppermost part of the encircling stripe inclined toward the front of the airplane.

C Flight - One stripe encircling the fuselage at a 45° angle from the horizontal with the uppermost part of the encircling stripe inclined toward the rear of the airplane.

c. Command identification stripes will not be employed by headquarters squadrons of Air Bases, Wings, or the G.H.Q. Air Force.

10. **NAMES OF COMBAT CREW.** - a. Door Type Airplanes. Names of permanently assigned members of the combat crew will be posted on the inside of the door. For this purpose, a metal holder with celluloid cover, size approximately 5" x 7", containing a typed list of the combat crew will be utilized.

b. Cockpit Type Airplanes - Names of permanently assigned members of the combat crew to be stenciled or painted on the forward portion of the left side of the fuselage; letters to be approximately 1/2" in height; white, and on a black rectangular background of suitable dimensions.

11. **PAINT TO BE USED.** -

a. On airplanes not camouflaged - All painted insignia, organization identification colors, etc., enamel, Specification 3-98, insignia colors in oil, Specification 3-120, or lacquer, Specification 3-158, will be used.

b. On camouflaged airplanes - The only paints, regardless of the purpose for which used, that will be applied to the exterior surface of camouflaged airplanes, will be Air Corps camouflage materials, (Spec. Nos. 14105, 14106 or 14109) and of colors covered by Air Corps Bulletin No. 41. Primer, metal, zinc chromate, Spec. 14080, will be used whenever a primer coat is required.

By order of the Chief of the Air Corps:

O. P. ECHOLS

Brigadier General, U.S.A.  
Chief, Materiel Division