

FABRICATION OF UNIQUE IDENTIFICATION NAMEPLATES OF AIRCRAFT ITEMS

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Date: DRAFT

FABRICATION OF UID NAMEPLATES OF AIRCRAFT ITEMS

Prepared By:

Approved By:

Thesa Ramos,
Committee G8

Frank Ead,
Committee Chairman

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1 SCOPE

1.1 PURPOSE

This specification provides requirements for material and process qualification of photo-sensitive nameplates and laser bonding on nameplates for Unique Identification marking. This specification also establishes the requirements for fabrication, marking, and application of LM Aero nameplates.

1.2 INTERPRETATION

Final authority for the interpretation of the intent of this specification is the sole right of LM Aero Materials and Processes Engineering (M&PE).

2 APPLICABLE DOCUMENTS

The publications listed below shall apply only as required within this document. The contract or Purchase Order may list added requirements. Unless a particular issue is listed, use only the latest issue or the issue in effect on the date of the contract. LM Aero documents are listed on the Lockheed Martin Electronic Network. For Industry, Federal, and Military documents, use that organization's electronic listings and/or Department of Defense Index of Specifications and Standards (DODISS) for current issues. For applicable documents that have been cancelled and no superseding document has been specified, the issue in effect just prior to its cancellation shall apply. Usage of any other issues requires written approval from LM Aero M&P before use. This specification shall govern if conflicts are found with any publication listed below. Contact LM Aero M&P for resolution of conflicts.

2.1 INDUSTRY DOCUMENTS

AMS 2629	Fluid, Jet Reference
AMS 3819	Cloths, Cleaning for Aircraft Primary and Secondary Structural Surfaces
AMS 5513	Steel, Corrosion-Resistant, Sheet, Strip, and Plate
AMS QQ-A-250/11	Aluminum Alloy 6061, Plate and Sheet
ASTM B 117	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D 329	Standard Specification for Acetone
ASTM G 155	Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials
ISO/IEC 15415	Bar Code Print Quality Test Specification – Two Dimensional Symbols
TT-I-735	Isopropyl Alcohol

2.2 FEDERAL DOCUMENTS

GG-P-455	Plates and Foils, Photographic (Photosensitive Anodized Aluminum)
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2.3 MILITARY DOCUMENTS

MIL-C-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-PRF-7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL-PRF-83282	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base
MIL-PRF-87252	Coolant Fluid, Hydrolytically Stable, Dielectric

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MIL-PRF-87937 Cleaning Compound, Aerospace Equipment
MIL-STD-130 Identification of Marking of U.S. Military Property

2.4 LM AERO DOCUMENTS

LMA-D0006 Engineering Materials and Approved Products
LMA-PN008 Unique Identification of Aircraft Items

3 REQUIREMENTS

3.1 GENERAL

Unique Identification (UID) marking requirements shall be per LMA-PN008 and applicable program requirements. Engineering drawing and/or program or company process specification shall specify type of marking, nameplate thickness and application method.

3.2 MATERIALS

Materials used for nameplate fabrication in accordance with this specification shall be as specified herein.

3.2.1 PHOTO-SENSITIVE NAMEPLATE

Photo-sensitized aluminum stock shall be per GG-P-455 Type 1, Class 1. This nameplate stock is available in 0.003 inch thick, 0.005 inch thick and 0.020 inch thick. The engineering drawing and/or program or company process specification shall specify the thickness of the nameplate to be used. Ensure that the material used for Unique Identification is matte finish. Nameplate per GG-P-455 satin finish shall not be used for Unique Identification.

3.2.2 LASER BONDING ON NAMEPLATE

Laser bonding on nameplate shall be per AMS 5513, type 304 stainless steel. This nameplate stock is available in 0.020 inch and 0.050 inch thick.

3.2.3 GENERAL CLEANER

Solvents approved for use include TT-I-735 (Isopropyl Alcohol), ASTM D 329 (acetone), or approved alternate as designated by applicable program's Materials and Processes Engineering (M&PE) organization. Solvents mentioned above shall not be used near or around the canopy area. For solvent usage near or around the canopy, refer to applicable program requirements and specifications. Approved solvents and sources are documented in EMAP and may vary depending on location. Usage and disposal of solvents shall be per applicable local company regulations.

3.2.4 CLEANING CLOTHS

Cleaning Cloths per AMS 3819 Grade A or applicable program alternates shall be used for solvent wiping to remove soil and/or contaminants.

3.3 CONTROL PROCEDURES FOR MATERIALS AND PARTS

Adhesive backed nameplates and photo-sensitive nameplates shall be stored at 65-75 °F for no more than 24 months. Other consumables shall be stored per manufacturer's instructions.

3.4 MARKING REQUIREMENTS

Unique Item Identifier (UII) data matrix encoding and UID marking shall be per requirements of LMA-PN008. Processed nameplates shall be verified per LMA-PN008 print quality verification test. Each UII shall be readable using a 2-Dimensional data matrix reader.

3.5 NAMEPLATE MARKING PROCESS

3.5.1 PHOTO-SENSITIVE NAMEPLATE

Photo-sensitive nameplates for parts or assemblies shall be produced by photographic reproduction on sensitized sulfuric acid anodized aluminum stock conforming to GG-P-455 Type 1, Class 1 (matte finish).

3.5.1.1 Nameplate Fabrication Procedure

The glass, film, and photo-sensitive aluminum sheets shall be clean and free from contamination prior to processing. A static brush will be useful in removing dust. Photo processing of the nameplate shall be per manufacturer's instructions or as outlined below:

3.5.1.1.1 Exposure of Photo-Sensitive Aluminum Sheets – Expose the photosensitive plate/sheet through a film negative in a contact vacuum exposure frame. The areas on the plate that are exposed to light turn black and those unexposed to light remain silver. The photosensitive aluminum sheets shall be exposed to ultraviolet light for a length of time sufficient to produce clearly defined characters.

3.5.1.1.2 Development and Fixing – After exposure, the plate shall be developed and fixed per manufacturers instructions. After this point in the process, the plate is no longer photosensitive. It is fully imaged with black and silver copy.

3.5.1.1.3 Rinsing – Rinse the processing chemicals off the plate by placing it in a rinse tank unit that simultaneously rinses both sides.

3.5.1.1.4 Seal – The plate must be sealed by immersing in a sealing tank unit filled with a heated solution. The solution shall be maintained at a rolling boil during plate immersion. When specified on the engineering drawing and/or program or company process specification, it is acceptable to apply an overcoat per program requirements in lieu of seal and post seal treatment steps per paragraphs 3.5.1.1.4 and 3.5.1.1.5.

3.5.1.1.5 Post Seal Treatment – After sealing, perform a post sealing treatment rinsing in a diluted de-spotting, de-smutting agent. Air dry. Apply a protective film or place in a clean sealed container for protection.

3.5.1.1.6 Application of Adhesive Bonding Film – This step is only applicable when specified on the engineering drawing and/or program or company process specification to use pressure sensitive adhesive. The adhesive bonding film shall be per engineering drawing and/or program or company specification. The adhesive bonding film shall be applied to the back of the nameplate, with the liner left on the back of the film, such that the film does not entrap air bubbles or dust particles and does not contain any wrinkles.

Note: When the engineering drawing and/or program or company specifications specify to use sealant or adhesive other than pressure sensitive adhesive bonding film, reference paragraph 3.6.2.2(a).

3.5.2 LASER BONDING ON NAMEPLATE

Laser bonding is an additive process that involves the bonding of a material to the substrate surface using heat generated by a laser. Laser bonding shall only be used on stainless steel nameplates. The nameplate shall be SAE-AMS 5513, type 304 stainless steel nameplates. The engineering drawing and/or program or company specification shall specify thickness of the nameplate to be used and application method.

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3.5.2.1 Laser Bonding Procedure

The nameplate shall be clean and free from contamination prior to processing. Use only materials approved for Laser bonding per applicable LM Aero EMAP listings.

3.5.2.1.1 Clean Nameplate – The nameplate shall be cleaned using approved cleaning cloth (reference paragraph 3.2.4) moistened with general cleaner (reference paragraph 3.2.3). Immediately wipe surface dry using clean dry cleaning cloth.

3.5.2.1.2 Bonding Paste Application – Apply a thin coat of bonding paste to the nameplate using a paint brush, foam brush, or spray application. Ensure the paste is applied with an even, thin coat. Let the coating dry for approximately 2 minutes.

Note: If the bonding paste is applied too thin, the mark will not be as dark. If the bonding paste is applied too thick, it will require more power to create the mark.

3.5.2.1.3 Marking on Nameplate – Mark the coated nameplate using laser equipment. Note that all lasers react differently depending on the type of laser, the laser's power, speed, and dot size.

3.5.2.1.4 Rinsing – Wipe bonding paste off surface of processed nameplate using cleaning cloth (reference paragraph 3.2.4) moistened with de-ionized water. Wipe until all bonding paste are removed.

3.6 NAMEPLATE APPLICATION PROCEDURE

For non-adhesive backed nameplates, the method of attachment shall be as required by the engineering drawing and/or program or company process specification. For adhesive backed nameplates, the adhesive bonding film shall be per applicable program engineering drawing or process specification.

3.6.1 PRE-APPLICATION PROVISIONS

3.6.1.1 Surface Temperature – Nameplates shall not be applied to surfaces which have a temperature below 70 °F.

3.6.1.2 Freshly Painted Surfaces – Freshly painted surfaces shall be dried for 8 hours minimum before the application of nameplates.

3.6.1.3 Protective Film Covering – If applicable, translucent protective film, covering the message surface of nameplates for protection, shall be left on until nameplate is applied to the receiving surface. Ensure that the protective film is removed immediately after installation to eliminate foreign object debris (FOD).

3.6.1.4 Cutting to Size – If nameplates are supplied untrimmed, cut along trim line to final size prior to installation. Nameplates shall not be trimmed on the surface to which it is applied.

3.6.2 APPLICATION PROCEDURE

3.6.2.1 Surface Preparation – The receiving surface shall be cleaned using approved cleaning cloths (reference paragraph 3.2.4) moistened with general cleaner (reference paragraph 3.2.3). The solvent shall not be allowed to evaporate on the receiving surfaces; wipe dry with clean, dry cleaning cloth.

3.6.2.2 Nameplate Application

- a) For non-adhesive backed nameplate: The nameplate shall be applied to the prepared surface using approved sealant, adhesive or mechanical fastener as specified in the engineering drawing and/or program or company specification.
- b) For adhesive backed nameplate: Remove the adhesive backing on the nameplate and apply to the prepared surface.

3.6.2.3 Nameplate Removal – When a nameplate is removed, all adhesive (if applicable) remaining on the surface shall be removed using approved general cleaner (reference paragraph 3.2.3).

3.7 QUALIFICATION REQUIREMENTS

All materials and marking processes used shall be qualified and tested per requirements below prior to production use. When a product has been qualified, any change in the constituent materials or method of manufacture shall require re-qualification or the prior written approval of LM Aero Materials and Process Engineering for the applicable program. Products qualified under this specification shall be qualified as a system (e.g. peculiar processing chemicals and equipment) and must be used as a system.

3.7.1 PRINT QUALITY

Nameplates shall be capable of producing ISO/IEC 15415 machine readable information (MRI) data matrix meeting the quality requirements per MIL-STD-130 of grade B (3.0) or better as tested per paragraph 3.8.1. As an exception, the ISO/IEC 15415 parameters, Modulation (MOD) and/or Symbol Contrast (SC), may measure as low as grade C (2.0), providing the overall ISO/IEC 15415 grade would be grade B (3.0) or better without accounting for the Modulation and/or Symbol Contrast grades.

3.7.2 PERMANENCE

Markings on processed nameplates shall be durable and permanent. As a minimum, the following environmental resistances shall be met.

3.7.2.1 Fluid Resistance

Processed nameplates shall be resistant to exposure of fluids and conditions listed in Table I when tested per paragraph 3.8.2. No fading or color change that impairs the functionality of the nameplate and readability of the two dimensional data matrix. The Machine Readable Information (MRI) shall be readable with a two dimensional (2-D) data matrix reader.

Table I – Fluid Resistance Exposure

Fluid	Fluid Specification	Exposure Time	Exposure Temperature
Deionized Water	NA	24	ambient
Fuel	AMS 2629 Type 1	72	140 +/- 10 °F
Engine Oil	MIL-PRF-7808	12	200 +/- 10 °F
Hydraulic Fluid	MIL-PRF-83282	72	ambient

Polyalphaolefin	MIL-PRF-87252	72	ambient
Cleaning Compound 1	MIL-PRF-87937C Type II or Type IV	24	ambient
Cleaning Compound 2	EMAP A411.5010	Wet Cloth wipe followed by dry wipe with clean cloth	ambient

3.7.2.2 Abrasion Resistance

The machine readable information (MRI) on processed nameplate shall be readable, using a 2-D data matrix reader, after 7000 revolutions of an abrasive wheel when tested per paragraph 3.8.3.

3.7.2.3 Corrosion Resistance

Processed nameplate shall show no evidence of corrosion that can cause the loss of readability of the MRI when tested per paragraph 3.8.4. The MRI shall be readable using a 2-D data matrix reader.

3.7.2.4 Heat Resistance

Processed nameplate shall withstand a minimum temperature of 500 +/- 10 °F for a period of 4 hours, without any loss of readability of the MRI when tested per paragraph 3.8.5. The MRI shall be readable using a 2-D data matrix reader.

3.7.2.5 Weather Resistance

Processed nameplate shall be capable of withstanding an equivalent accelerated weathering test without exhibiting any loss of readability to the MRI when tested per paragraph 3.8.6. The MRI shall be readable using a 2-D data matrix reader.

3.8 MARKING PROCESS QUALIFICATION TEST METHODS

Machine-readable information (MRI) shall be per LMA-PN008. For each test method, there shall be a minimum of 3 replicates per candidate to be tested. Processed nameplate does not require to be mounted on to a test panel, unless otherwise specified.

3.8.1 QUALITY OF PRINT

MRI shall be digitally scanned using 2-D data matrix verification equipment. The print quality shall be evaluated for conformance to paragraph 3.7.1.

3.8.2 FLUID RESISTANCE

For each of the fluids given in Table 1, processed nameplates shall be immersed in the fluid for the required exposure time and temperature. After exposure, the nameplate shall be examined for conformance to paragraph 3.7.2.1.

3.8.3 ABRASION RESISTANCE

Processed nameplates shall be 4 x 4 inches and can be mounted on 4 x 4 inches test panel to provide a total thickness of approximately 0.040 inch using AMS 3281 polysulfide sealant or equivalent per program requirements. The test panels can be AMS-QQ-A-250/11, conversion coated per MIL-C-5541, Class 1A, immersion applied. The test panels shall have a ¼ inch diameter hole in the center. Ensure that the MRI is under the path of the abraser wheel. Test on a Taber Abrader using CS-17F wheel and a 1000 gram load for 7000 revolutions. After 7000 revolutions examine conformance to requirements of paragraph 3.7.2.2.

3.8.4 CORROSION RESISTANCE

A fully processed nameplate shall be tested per ASTM-B-117 into the salt spray chamber supported at 15 degrees from the vertical and preferably parallel to the principal direction of flow of fog through the chamber for 336 hours. The panel shall be examined for conformance to paragraph 3.7.2.3.

3.8.5 HEAT RESISTANCE

Use an oven capable of maintaining a continuous temperature of 500 ± 10 °F. Processed nameplate shall be placed in an oven pre-heated to 500 ± 10 °F and maintained at this temperature for 4 hours. Remove and visually examine nameplate and marking. The panel shall be examined for conformance to paragraph 3.7.2.4.

3.8.6 WEATHER RESISTANCE

Processed nameplate shall be exposed in an unprotected location in accordance with ASTM G 155 Cycle 1 for 300 hours. After exposure, the panels shall be examined for conformance to paragraph 3.7.2.5.

3.8.7 RETEST

Retesting is allowed in the event of failing data. The number of retest specimens shall be the same as required for the original test. Both data sets shall be reported as well as the cause (if known) of the original failure.

4 QUALITY ASSURANCE PROVISIONS

4.1 RESPONSIBILITY FOR INSPECTION

Quality Assurance shall perform inspection(s) as necessary to ensure compliance with all of the requirements of this specification. The purchaser reserves the right to perform any of the inspections set forth herein, where deemed necessary, to assure that the product conforms to the prescribed requirements.

4.1.1 LM AERO FACILITIES

An effective Quality Assurance System shall be installed that will ensure compliance with all of the requirements of this specification when the operations are performed at a Lockheed Martin Aero facility.

4.1.2 SUBCONTRACTORS/SUPPLIERS

The Lockheed Martin Aeronautics Quality Assurance Organization shall approve the Quality Assurance System employed by subcontractors and/or facilities other than Lockheed Martin, including subcontractor's sub-tier suppliers/processors. Unless otherwise specified in the contract or purchase order, the subcontractor/supplier shall be responsible for the performance of all inspection required by this specification.

4.2 INSPECTION PROCEDURE

Inspection shall ensure that approved materials and procedures are used to produce the nameplates. Self verification shall be performed on each MRI for readability using a 2-D data matrix reader. Periodic print quality verification in compliance with LM Aero Quality Assurance procedures shall ensure requirements per LMA-PN008 are met.

5 NOTES

5.1 MARGINAL INDICIA

A vertical line in the left margin is used to show technical changes from the prior issue of this specification. This was done as a convenience only and LM Aero assumes no liability whatsoever for any inaccuracies in these notations. Users of this document are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

5.2 DEFINITIONS

The following are definitions of terms used within this specification. They apply only to this specification.

- A. Distributor – This is the business entity that receives and stores materials or products from a manufacturer for resale. The distributor does nothing to alter the materials or products as furnished by the manufacturer
- B. Manufacturer - The business entity producing the materials or product to the requirements of the procurement documents.
- C. Machine Readable Information (MRI) – A pattern of bars, squares, dots, or other specific shapes containing information interpretable through the use of equipment specifically designed for that purpose.
- D. Purchasing Agent - The business entity that places the purchase orders or contracts with the seller (supplier) on behalf of the user
- E. Re-packager - The business entity, either the manufacturer or an alternate approved by LM Aero - Fort Worth, that alters the material or product using any process, which includes resizing the original package.
- F. Seller - The business entity that receives the purchase orders or contracts from the purchasing agent and furnishes the materials or products directly to the user.
- G. Unique Identification (UID) – A system of establishing globally unique and unambiguous identifiers within the Department of Defense, which serves to distinguish a discrete entity or relationship from other like and unlike entities or relationships.
- H. User - The business entity using the materials or product purchased to procurement document requirements.

6 ACKNOWLEDGEMENT

A supplier shall reference this specification number, its revision letter, and amendment in all quotations and when acknowledging purchase orders.

7 NONCONFORMING

A product not conforming to this specification or the Purchase Order is cause for rejection.

8 ENVIRONMENT SAFETY AND HEALTH

Materials supplied and/or parts manufactured to this specification shall comply with all LM Aero/site-specific environmental, safety, and health (ESH) policies and procedures. These requirements may be obtained from a local ESH representative. An ESH-approved Material Safety Data Sheet (MSDS) must be on file at LM Aero prior to delivery. Subcontractors and vendors are responsible for compliance with all applicable environmental, safety, and health (ESH) regulations for their facilities. Any conflict between these regulations and the processes of this specification shall be communicated to LM Aero for resolution.



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