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George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

REQUIREMENTS FOR
SURFACE PREPARATION
AND
APPLICATION OF
DRY FILM LUBRICANTS

Prepared by:

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MSFC-RQMT-1282A

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RELEASE

GEORGE C. MARSHALL SPACE FLIGHT CENTER
MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812

REQUIREMENTS FOR SURFACE PREPARATION
AND
APPLICATION OF DRY FILM LUBRICANTS

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January 1986

REQUIREMENTS FOR
SURFACE PREPARATION
AND
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MSFC-RQMT-1282

ENGINEERING PHYSICS DIVISION
MATERIALS AND PROCESSES LABORATORY
MARSHALL SPACE FLIGHT CENTER, AL

1. SCOPE
 - 1.1. SCOPE - These requirements apply to materials listed herein which require surface cleaning and finishing prior to application of dry film lubrication.
 - 1.2. PURPOSE - This requirement is intended to aid in processing parts and materials to be coated or treated with a dry film lubricant. The procedure is applicable to the parts and materials listed in Tables I, II, and III and the specifications in paragraph 2.1 only.
 - 1.3. CLASSIFICATION - The glass bead blast and/or cleaning procedures as specified shall be applicable to the types and classes, classified according to configuration and materials, as follows:
 - 1.3.1. Type I - Type I parts are items made of high nickel alloys which contain greater than 10% chrome but are not plated.
 - 1.3.2. Type II - Type II parts are items made of high nickel alloys which contain less than 10% chrome or parts which are chrome or nickel plated.
 - 1.3.3. Type III - Type III parts are special items which have two or more different surface treat conditions which have to be treated individually. Also parts which have threaded fasteners.
 - 1.3.4. Type IV - Type IV parts are those made of aluminum alloys.
- 2.0. APPLICABLE DOCUMENTS
 - 2.1. The following documents, of the issue in effect on the date of approval of this procedure, form a part of the procedure to the extent specified herein.

SPECIFICATIONS

FEDERAL SPECIFICATIONS

QQ-P-35 - Passivation Treatments for Austenitic, Ferritic, and Martensitic Corrosion - Resisting Steel (Fastening Devices)

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MSFC-SPEC-164 - Cleanliness of Components for Use in Oxygen, Fuel, and Pneumatic Systems, Specification for

MSFC-DWG-50M60434 - Lubricant Dry Film, MLR-2 and NPI-425,
Preparation and Application of

MILITARY SPECIFICATION

MIL-STD-130 - Identification Marking for U. S. Military Property

ROCKETDYNE

RB0140-007 - Lubricant, Dry Film Phosphoric Acid Bonded

RA0112-003 - Lubricant, Dry Film Phosphoric Acid Bonded,
Application of

RA0112-007 - Lubrication, Dry Film, Burnishing of

3.0. REQUIREMENTS

3.1. IDENTIFICATION - Parts received for processing in accordance with this requirement must be identified with part number and serial number, if specified by drawing requirements. The identification shall be in accordance with requirements of MIL-STD-130. Nylon bagging and an included identification tag is acceptable when on-surface identification is not practical because of physical size or lack of a non-critical surface. This "bagging and tagging" would be acceptable for large quantities of identical items such as nuts, bolts, pins, etc.

3.2. MATERIALS - Processing and protection materials used shall be as specified herein, on the drawing or specified in the reference of 2.1.

3.2.1. TEST AND CLEANING SOLVENTS - All materials used in this procedure must be in compliance with requirements of MSFC-SPEC-164, paragraph 3.2. through 3.2.13.

3.2.1.1. GLASS BEADS - Glass beads used in this procedure must be Delong Equipment Company size no. 801-212-1836 or equivalent.

3.3. PRECLEANING

3.3.1. PRECLEANING - All parts subjected to glass bead blasting and/or cleaning per this requirement must have been previously vapor degreased in accordance with MSFC-SPEC-164. Final cleaning per MSFC-SPEC-164 (except no particulate contamination greater than 700 microns in any dimension) is not required prior to glass bead blasting, but will be required for the final rinse, see 3.4.8.

- 3.4. TYPE I PARTS - Type I parts as defined in 1.3. shall be processed as specified in this procedure and as shown on Table I.
- 3.4.1. DRY BEAD BLAST - Surfaces on the drawing requiring dry film lubrication must be dry bead blasted with Delong Equipment Company size no. 801-212-1836 glass beads, or equivalent. Blasting should be just enough to make the entire surface to be coated have a matte finish. Every effort must be made to remove only as much material as is necessary to obtain a matte finish. Adjacent surfaces may be protected with masking tape or plater's tape as required.
- 3.4.2. AIR RINSE - Blow off blasting debris using clean dry shop air so as not to contaminate cleaning solutions used in subsequent operations.
- 3.4.3. ULTRASONIC CLEANING - Ultrasonic clean per MSFC-SPEC-164 in Freon for 5 minutes or until glass beads and residue from the bead blasting process have been completely removed.
- 3.4.4. PASSIVATION - Passivate according to material type per Federal Specification QQ-P-35. The specification covers six types of passivation treatments for austenitic, ferritic, martensitic, and precipitation hardening corrosion resisting steels.
- 3.4.5. WATER RINSE - Rinse in deionized water for 15 minutes to remove all passivation solution. Deionized water must be in accordance with requirements of paragraph 3.2 and must be in the range of Ph 6 - 8 with a specific resistance of greater than 50,000 ohms.
- 3.4.6. AIR RINSE - Blow with dry air until completely dry.
- 3.4.7. SEALING - Within one hour after water rinse, immerse in a 5.0% sodium dichromate solution for 30 minutes at 140 - 160 degrees F.
- 3.4.8. LOX CLEANING - Clean with Freon only to meet requirements of MSFC-SPEC-164. Both NVR and particulate requirements must be met except no particles greater than 700 microns in any dimension shall be allowed. Parts must be immediately bagged to maintain cleanliness integrity.
- 3.4.8.1. FUEL AND PNEUMATIC SYSTEMS AND FLIGHT EXPERIMENT CLEANING - Items not requiring LOX cleanliness (and compatibility) should be processed per MSFC-SPEC-164 for Fuel Service.

- 3.4.9. DRY FILM LUBRICANT APPLICATION - Application of dry film lubrication shall be as specified on the individual drawing, relative to area to be coated, type of dry film to be used, and thickness required. Details of dry film application and curing cycle shall be as recommended by the dry film manufacturer. It is recommended that coupons similar in shape and material to the items to be coated be completely processed before the drawing hardware to establish variables and controls, i.e., spraying parameters affecting lubrication thickness, quality, etc.
- NOTE: The requirement that dry film application be done within 16 hours after the bead blast/cleaning processes does not apply if the cleanliness of the part has been maintained by proper packaging.
- 3.4.10. CONTAMINATED PARTS - In the event that there is reason to question the cleanliness of parts presented for dry film lubricant application, they shall be vapor degreased and recleaned per MSFC-SPEC-164.
- 3.4.11. CERTIFICATION OF LUBRICATION - After parts have been lubricated, baked, and burnished in accordance with the drawing and applicable specifications, a certification tag shall be made out showing the parts identity (Nomenclature, Part Number, and Serial Number as supplied), date, and type lubricant applied including the lubricant batch number. This tag shall be placed between the outer bag and inner bag with the information readable without removing the part or tag from the outer plastic bag.
- 3.4.12. PACKAGING - Parts shall be packaged in accordance with requirements of MSFC-SPEC-164 until ready for final cleaning.
- 3.4.13. FINAL RINSE AND CONTAMINATION SAMPLE - Completed parts shall be subjected to final Freon rinse.
- 3.4.13.1. CLEANLINESS VERIFICATION - Rinse all surfaces with Freon to remove any loose residual debris from the dry film application (and burnishing) process (es).
- 3.4.14. PACKAGING - Each item shall be individually packaged in an inner bag of Nylon 6 and an outer bag of polyethylene. Each bag shall be suitably sealed with heat sealer to provide a moisture barrier.

- 3.5. TYPE II PARTS - Type II parts as defined in 1.3. shall be processed as specified herein and as shown in Table II. All parts must be precleaned per paragraph 3.3.1.
- 3.5.1. DRY BEAD BLAST - Dry bead blast as specified in 3.4.1.
- 3.5.2. AIR RINSE - Air rinse as specified in 3.4.2.
- 3.5.3. ULTRASONIC CLEANING - Ultrasonic clean as specified in 3.4.3.
- 3.5.4. ALKALINE RINSE - Rinse in mild alkaline detergent solution, Turco 4215 or equivalent, at 160 +/-20 degrees F for 8 - 10 minutes.
- 3.5.5. HOT WATER RINSE - Rinse in deionized water at 160 +/-20 degrees F for 15 minutes. Deionized water must be in accordance with paragraph 3.2. and must be in the range of Ph 6 - 8 with a specific resistance of greater than 50,000 ohms.
- 3.5.6. AMBIENT WATER RINSE - Rinse in deionized water at ambient temperature for 15 minutes.
- 3.5.7. AIR RINSE - Blow with dry air until completely dry.
- 3.5.8. CLEANING - Clean as specified in 3.4.8.
- 3.5.9. DRY FILM LUBRICANT APPLICATION - Apply dry film lubricant as specified in 3.4.9.
- 3.5.10. CONTAMINATED PARTS - Contaminated parts shall be recleaned as specified in 3.4.10.
- 3.5.11. CERTIFICATION OF LUBRICATION - Certification tag shall be attached as specified in 3.4.11.
- 3.5.12. PACKAGING - Packaging shall be as specified in 3.4.12.
- 3.5.13. FINAL RINSE AND CONTAMINATION SAMPLE - Final Freon rinse as specified in 3.4.13.
- 3.5.13.1. CLEANLINESS VERIFICATION - Verify cleanliness as specified in 3.4.13.1.
- 3.5.14. PACKAGING - Package as specified in 3.4.14.
- 3.6. TYPE III PARTS - Type III parts as defined in 1.3. shall be processed as specified herein and as shown in Table II. All parts must be precleaned per paragraph 3.3.1.

- 3.6.1. PLATED SURFACES
 - 3.6.1.1. SILVER PLATED SURFACES - Silver plated surfaces are to be masked off using Turco No. 522 neoprene masking, or equivalent, to protect them during bead blasting of other surfaces to be lubricated.

NOTE: Masking material must be removed after bead blast per 3.5.1. so that cleaning processes specified in 3.5.2. and subsequent will apply to all surfaces of the part.
 - 3.6.1.2. CHROME PLATED SURFACE - Chrome plated surfaces are to be processed as specified in 3.5.1. through 3.5.14. (Type II parts).
- 3.6.2. THREADED SURFACES - Threaded surfaces are to be processed according to their substrate material with the exception that bead blasting is not required.
- 3.7. TYPE IV PARTS - Type IV parts as defined in 1.3. shall be processed as specified herein and as shown in Table III.
 - 3.7.1. Anodized Aluminum-Aluminum Alloy parts which have surfaces requiring both anodize and dry film lubricant coatings must be anodized prior to dry film lubricant application.
 - 3.7.2. DRY BEAD BLAST - Dry bead blast as specified in 3.4.1.
 - 3.7.3. AIR RINSE - Air rinse as specified in 3.4.2.
 - 3.7.4. CLEANING - Clean as specified in 3.4.8.
 - 3.7.5. DRY FILM LUBRICANT APPLICATION - Apply dry film lubricant as specified in 3.4.9.
 - 3.7.6. FINAL RINSE AND CONTAMINATION SAMPLE - Dry film lubricated parts shall be processed as specified in 3.4.13. and recleaned per 3.4.8. if necessary. Anodized aluminum parts do not require 3.7.9. through 3.7.11.
 - 3.7.7. CERTIFICATION OF LUBRICATION - Certification tag shall be attached as specified in 3.4.11.
 - 3.7.8. PACKAGING - Packaging shall be as specified in 3.4.12.
 - 3.7.9. PREPARATION FOR PAINTING - Before painting, protection of the dry film lubrication surfaces must be accomplished by suitable means. Where oxygen

compatibility is required masking tape or plater's tape must not be applied directly on the dry film lubricant surface.

- 3.7.9.1. PAINTING - Painted surfaces should be coated per the drawing requirements subsequent to dry film lubrication application and curing.
- 3.7.10. FINAL RINSE AND CONTAMINATION SAMPLE - Final Freon rinse and sample for contamination as specified in 3.4.13.
- 3.7.11. PACKAGING - Packaging shall be as specified in 3.4.14.

TABLE 1

NON-PLATED SUBSTRATE MATERIALS

MSFC-RQMT-1282 REV. A

UNNS NUMBER	COMMON DESIGNATION	SURFACE TREATMENT	TREATMENT TYPE	GLASS BEAD BLAST PER PP.3.4.1.	BLOW OFF W/CLEAN AIR PER PP.3.4.2.	ULTRASONIC CLEAN PER PP.3.4.3.	ALKALINE RINSE PER PP.3.5.4.	HOT WATER RINSE PER PP.3.5.5.	PASSIVATE PER PP.3.4.4.	AMBIENT WATER RINSE PER PP.3.4.5.	BLOW DRY W/CLEAN AIR PER PP.3.4.6.	SEAL PER PP.3.4.7.	CLEAN PER PP.3.4.8.	APPLY DRY-FILM LUBE PER PP.3.4.9.	FINAL CLEAN AND SAMPLE PER PP.3.4.13.
N07001	WASPALLOY	I	X	X	X				X	X	X	X	X	X	X
N07718	INCONEL 718	I	X	X	X				X	X	X	X	X	X	X
S21800	NITRONIC 60	I	X	X	X				X	X	X	X	X	X	X
S30000	300 CRES	I	X	X	X				X	X	X	X	X	X	X
S30200	302 CRES	I	X	X	X				X	X	X	X	X	X	X
S44004	* 440C CRES	I	X	X	X				X	X	X	X	X	X	X
S66286	A286 CRES	I	X	X	X				X	X	X	X	X	X	X

* 440C CRES DOES NOT CONTAIN NICKEL.

TABLE III
ANODIZED OR PAINTED
ALUMINUM PARTS AND MATERIALS

MSFC-RQMT-1282 REV. A

MATERIAL \ SURFACE TREAT	TREATMENT TYPE	ANODIZE PER DRAWING RQMT'S	GLASS BEAD BLAST PER PP 3.4.1.	BLOW OFF W/CLEAN AIR PER PP 3.4.2.	CLEAN PER PP 3.4.8.	APPLY DRY FILM LUBE PER PP 3.4.9.	PREPARE FOR PAINTING PER DRAWING RQMT'S PER PP 3.7.9.	PAINT PER DRAWING RQMT'S PER PP 3.7.9.	FINAL CLEAN AND SAMPLE PER PP 3.4.13.		
ANODIZED ALUMINUM (ALL ALLOYS)	IV	X	X	X	X	X			X		
PAINTED ALUMINUM (ALL ALLOYS)	IV		X	X	X	X	X	X	X	X	

PACKAGE NO. 10443R

DOCUMENTATION RELEASE LIST
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PAGE 1

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ISSUE DATE FEB 22 2007

C H	DOCUMENT NUMBER	DRL DRL DSH REV	TITLE	CCBD NO.	PCN	PC	EFFECTIVITY
*	MSFC-RQMT-1282	202 -	SURFACE PREPARATION APPLICATION OF DRY FILM LUBRICANTS	000-00-0000	0000000	ZA	NONE

CHG NO.	CHG REV	CHG NOTICE	RESPONSIBLE ENGINEER	RESPONSIBLE ORGANIZATION	ACTION DATE	DESCRIPTION	
	A	DCN000	H. GIBSON	EH14	03/02/94	REVISION 'A' RELEASED 08/25/89.	
*	1	A	DCN000	EUGENA GOGGANS	EO03	02/22/07	DOCUMENT RELEASED THRU PDS. NO LONGER TRACKED IN ICMS.

CHECKER

N/A
02/15/07

(FINAL)

PACKAGE NO: 10443R

PROGRAM/PROJECT: MULTI

LAST UPDATED: 02/22/07

NOMENCLATURE: MSFC-STD- GOING TO NONE EFFECTIVITY

ECR NO:	PCN:	CCBD NO:	DATE PREPARED:
EO03-0000	0000000	000-00-0000 SB3-00-0000	02/22/07

DWG SIZE	DRAWING NUMBER	DWG REV	EPL/DRL/DDS NUMBER	DWG REV	EPL DSH	EPL REV	EO DASH NUMBER	EO REV	PART NUMBER
			MSFC-HDBK-1453		202	-			
			MSFC-HDBK-1674		202	-			
			MSFC-HDBK-2221		203	-			
			MSFC-HDBK-505		202	-			
			MSFC-HDBK-670		202	-			
			MSFC-MNL-1951		209	-			
			MSFC-PROC-1301		202	-			
			MSFC-PROC-1721		202	-			
			MSFC-PROC-1831		202	-			
			MSFC-PROC-1832		202	-			
			MSFC-PROC-404		202	-			
			MSFC-PROC-547		202	-			
			MSFC-QPL-1918		204	-			
			MSFC-RQMT-1282		202	-			
			MSFC-SPEC-1198		202	-			
			MSFC-SPEC-1238		202	-			
			MSFC-SPEC-1443		202	-			
			MSFC-SPEC-164		202	-			
			MSFC-SPEC-1870		202	-			
			MSFC-SPEC-1918		203	-			
			MSFC-SPEC-1919		206	-			
			MSFC-SPEC-2083		202	-			
			MSFC-SPEC-2223		202	-			
			MSFC-SPEC-2489		206	-			
			MSFC-SPEC-2490		205	-			
			MSFC-SPEC-2491		203	-			
			MSFC-SPEC-2492		203	-			
			MSFC-SPEC-2497		211	-			
			MSFC-SPEC-250		202	-			
			MSFC-SPEC-445		202	-			
			MSFC-SPEC-504		202	-			
			MSFC-SPEC-521		202	-			
			MSFC-SPEC-548		202	-			
			MSFC-SPEC-560		202	-			
			MSFC-SPEC-626		202	-			
			MSFC-SPEC-684		202	-			
			MSFC-SPEC-708		202	-			
			MSFC-SPEC-766		202	-			
			MSFC-STD-1249		202	-			
			MSFC-STD-1800		202	-			
			MSFC-STD-246		202	-			
			MSFC-STD-2594		203	-			

PACKAGE NO: 10443R

DWG SIZE	DRAWING NUMBER	DWG REV	EPL/DRL/DDS NUMBER	DWG REV	EPL DSH	EPL REV	EO DASH NUMBER	EO REV	PART NUMBER
			MSFC-STD-2903		202	-			
			MSFC-STD-2904		202	-			
			MSFC-STD-2905		202	-			
			MSFC-STD-2906		202	-			
			MSFC-STD-2907		202	-			
			MSFC-STD-366		202	-			
			MSFC-STD-383		202	-			
			MSFC-STD-486		202	-			
			MSFC-STD-506		203	-			
			MSFC-STD-531		202	-			
			MSFC-STD-557		202	-			
			MSFC-STD-561		203	-			
			MSFC-STD-781		202	-			

SUBMITTED BY ENGINEERING AREA:	BASIC	CHANGE	PARTIAL	COMPLETE	CLOSES	ACTION
EO03		X		X		EO03

PREPARED BY:
EUGENA GOGGANS
12/19/06

SUBMITTED BY:

CONCURRENCE:

TRANSMITTAL DATES
TO RELEASE DESK 02/22/07 10:00
TO MSFC DOC REP 02/22/07 00:00

REMARKS:

2007 FEB 22 AM 11:22

MSFC DOCUMENTATION REPOSITORY - DOCUMENT INPUT RECORD

I. GENERAL INFORMATION

1. APPROVED PROJECT:	2. DOCUMENT/ DRAWING NUMBER: <p style="text-align: center;">MSFC RQMT I282 REV A</p>	3. CONTROL NUMBER:	4. RELEASE DATE: <p style="text-align: center;">08/25/1989</p>	5. SUBMITTAL DATE:
6. DOCUMENT/DRAWING TITLE: EQUIREMENTS FOR SURFACE PREPARATION & APPLICATION OF DRF FILM LUBES			7. REPORT TYPE: <p style="text-align: center;">PROC</p>	
8. CONTRACT NUMBER / PERFORMING ACTIVITY:		9. DRD NUMBER:		10. DPD / DRL / IDRD NUMBER:
11. DISPOSITION AUTHORITY (Check One): <input checked="" type="checkbox"/> Official Record - NRRS 8/12/A <input type="checkbox"/> Reference Copy - NRRS 8/5/A/3 (destroy when no longer needed)		12. SUBMITTAL AUTHORITY:		13. RELEASING AUTHORITY: <p style="text-align: center; font-size: 1.5em;"><i>M. Clark</i></p>
14. SPECIAL INSTRUCTIONS:				
15. CONTRACTOR/SUBMITTING ORGANIZATION, ADDRESS AND PHONE NUMBER:			16. ORIGINATING NASA CENTER: <p style="text-align: center;">MSFC</p>	
			17. OFFICE OF PRIMARY RESPONSIBILITY: <p style="text-align: center;">ED32/ TRIBOLOGY AND NDE GROUP</p>	
18. PROGRAMMATIC CODE (5 DIGITS):			19. NUMBER OF PAGES:	

II. ENGINEERING DRAWINGS

20. REVISION:	21. ENGINEERING ORDER:	22. PARTS LIST:	23. CCBD:
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III. REPORTS, SPECIFICATIONS, ETC.

24. REVISION: <p style="text-align: center; font-size: 2em;">A</p>	25. CHANGE:	26. VOLUME:	27. BOOK:	28. PART:	29. SECTION:
30. ISSUE:	31. ANNEX:	32. SCN:	33. DCN:	34. AMENDMENT:	
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IV. EXPORT AND DISTRIBUTION RESTRICTIONS

<input type="checkbox"/> Privacy Act (see MWI 1382.1)	<input type="checkbox"/> EAR (see MPG 2220.1)
<input type="checkbox"/> Proprietary (see MPD 2210.1)	<input type="checkbox"/> Other ACI (see NPG 1620.1 and MPG 1600.1)
<input type="checkbox"/> Patent (see MPG 2220.1)	<input checked="" type="checkbox"/> No statutory or institutional restrictions applicable -- material may be electronically distributed to user in the NASA domain
<input type="checkbox"/> ITAR (see MPG 2220.1)	

V. ORIGINATING ORGANIZATION APPROVAL

40. ORG. CODE: <p style="text-align: center;">TD61</p>	41. PHONE NUMBER: <p style="text-align: center;">(000) 544-2513</p>	42. NAME: <p style="text-align: center;">Howard Gibson</p>	43. SIGNATURE/DATE: <p style="text-align: center;"><i>Howard Gibson 10/17/02</i></p>
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VI. TO BE COMPLETED BY MSFC DOCUMENTATION REPOSITORY

44. RECEIVED BY: <p style="text-align: center; font-size: 1.5em;"><i>Jammy Wise</i></p>	45. DATE RECEIVED: <p style="text-align: center; font-size: 1.5em;">10-15-03</p>	46. WORK ORDER:
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