APPLICATION		CUI REVISIONS			
NEXT ASSY	USED ON	REV	DESCRIPTION	DATE	APPROVED
~	Landing Gear	A	SEE EO NO. 15A7142-H	2015/6/22	N. DAGSEN
		B	SEE EO NO. 17A0716-H	2018/4/18	LZPEX-HILL
		C	SEE EO NO. 19A0198-H	2019/5/9	LZPEX-HILL
		D	SEE EO NO. 21A0023-H	2021/3/17	LZPEX-HILL
		E	SEE EO NO. 21A0093-H	2022/01/21	LZPEX-HILL
		F	SEE EO NO. 2025C6491-H	2025/07/25	LZPEM-HILL

All SHEETS SAME REVISION LEVEL

NOTES:

1. Changes from previous revision. The margins of this specification are marked with black vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the previous issue.

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UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCE ON
FRACTIONS DECIMALS ANGLES
± 1/32 .X ± .3 ± 3°
.XX ± .10
.XXX ± .125

DO NOT SCALE DRAWING

CURRENT CAGE CODE

CONTRACT NUMBER		
DRAFTSMAN/ PRPARER: STEVEN THORNE	DATE: 2014/11/3	
CHECKER: RODNEY GOULD	DATE: 2015/1/26	
PROJECT ENGINEER: STEVEN THORNE	DATE: 2014/11/3	
ENGINEERING APPROVAL: BRAD MARTIN	DATE: 2015/1/13	
AF AUTHENTICATION: RON MONTGOMERY	DATE: 2014/11/10	
AIR FORCE RELEASE: SCOTT KINGSFORD	DATE: 2015/1/26	

U.S. AIR FORCE
OO-ALC HILL, AFB 84056

LANDING GEAR
REQUIREMENTS DOCUMENT

SIZE	CAGE CODE	DRAWING NUMBER	REV
A	98747	201416605	F

SCALE	WEIGHT	SHEET
N/A	N/A	1 OF 21

SUMMARY OF CHANGE

Revision F: Changed paragraphs 2, 5.2.1, 5.3.1, 8.1.1, 8.1.2, 8.1.3, 9.1, 9.2, 11.1.2, 11.4.1, 11.4.2, 11.4.3, 11.7.3, 13.2.1, 13.2.1.3, and 15.11.1. Added paragraphs 13.2.2 along with sub-paragraphs 13.2.2.1-13.2.2.5, and 15.2.1-15.2.4. Removed blank Sheet 2.

Revision E: Added note 1, added new sheet 2 and 21, updated paragraphs 6.4.1, 7.1, 9.4, 11.1.4, 15.11.1 and adjusted paragraph sheet locations.

Revision D: Changed paragraphs 1.1, 2, 4.2, 4.3, 10.2, 10.5, 10.8, 10.9, 10.10, 11.1.1, 11.1.2, 11.1.3, 11.2.1, 11.2.2, 11.2.3, 11.4.1, 11.8, and 11.9. Added Paragraphs 11.1.4 and 11.2.5

Revision C: Changed paragraphs 4.3, 6.1.1, 6.2.1, 9.8, 9.9, and 9.10.

Revision B: Changed paragraphs 2, 4.2, 4.3, 6.3.1, 6.4.1, 6.7.1, 10.1, 10.2, 10.5.2, 10.8, 11.1, 11.1.1, 11.3.1, 11.3.2, 11.3.3, 11.3.4, and 12.2.1.2. Added paragraphs 11.8, 15.12.1, 15.12.2, 15.12.3, and 15.12.4.

Revision A: Changed paragraphs 2, and 10.5. Added paragraphs 10.5.1, 10.5.2, 14.1.2, 15.14 (and all subparagraphs).

TABLE OF CONTENTS

SUMMARY OF CHANGES 2
1 SCOPE 4
2 APPLICABLE DOCUMENTS 4
3 ACRONYMS 7
4 DRAWING INTERPRETATION 8
5 MRB DISPOSITIONS 8
6 PART MARKING AND IDENTIFICATION 10
7 INSPECTION REQUIREMENTS 12
8 HEAT TREATMENT REQUIREMENTS 13
9 MATERIALS 13
10 PROCESSING REQUIREMENTS 14
11 FINISHING REQUIREMENTS 15
12 BUSHING INSTALLATION REQUIREMENTS 17
13 FORGING INFORMATION 18
14 CASTING INFORMATION 19
15 WEAPON SYSTEM SPECIFIC REQUIREMENTS 20

1. SCOPE

1.1. Purpose

This drawing establishes United States Air Force (USAF) engineering requirements for landing gear component part manufacture. The information provided herein is to be utilized as specified within contract requirements. Deviations or alterations to the specifications or processing requirements of this document must be approved by the USAF engineering procurement authority through appropriate contracting officer.

1.2. Application

The contents contained herein provide technical information to clarify and update materials, methods and processing of USAF landing gear component part manufacture. Some sections are applicable for all procurements and therefore it is the contractor's responsibility to understand and adhere to applicable sections in accordance with individual contract requirements.

1.3. Safety

Materials, methods, applications and processes described or referenced in this drawing may involve the use of hazardous materials. This drawing does not address these hazards. It is the responsibility of the contractor to ensure familiarity with the safe appropriate use of hazardous materials and processes; and to take necessary precautionary measures to ensure the health and safety of all personnel.

1.4. Approval

Any changes to this document must be approved by the USAF Landing Gear Systems Chief Engineer prior to publication.

1.5. Key Words

Key words for some processes are listed in bold text within the applicable paragraph. These key words shall be used in drawings and ECO's as necessary for clarification.

2. APPLICABLE DOCUMENTS

The following publications identify specifications and standards that are referenced in this document. In the event that a referenced contracted specification or standard contradicts or duplicates a requirement in this drawing; the requirements in this drawing shall govern. Contractor shall use the latest revision and if a referenced specification or standard becomes cancelled or deactivated, or if an alternative specification or standard is desired, the contractor shall seek replacement authorization from the procuring activity.

Document Number	Title
200827953	Label, Unique Identification (IUID), Landing Gear
201027456	Low Hydrogen Embrittlement Plating Process Specification Zinc-Nickel (Gamma Zn)
201414045	Grinding, Belt, Tungsten Carbide Coatings, Hard Chrome Platings, High Strength Steel

29 CFR 1910	Toxic and Hazardous Substances
AIA/NAS NAS0331	Bearing Installation and Retention by Swaging or Staking
AIA/NAS NASM33540	Safety Wiring, Safety Cabling, Cotter Pinning, General Practices For
AIA/NAS410	NAS Certification and Qualification of Nondestructive Test Personnel
ASME B46.1	Surface Texture (Surface Roughness, Waviness, and Lay)
ASTM B196	Standard Specification for Copper-Beryllium Alloy Rod and Bar
ASTM E1417	Standard Practice for Liquid Penetrant Testing
ASTM E1444	Standard Practice for Magnetic Particle Testing
BMS 3-38	Corrosion Inhibiting Compounds
BAC5405	Process Specification for the Dimensional Acceptance of Forgings and Castings
IPC-1066	Marking, Symbols and Labels for Identification of Lead-Free and Other Reportable Materials in Lead-Free Assemblies, Components and Devices
IPC-2221	Generic Standard on Printed Board Design
IPC-6012	Qualification and Performance Specification for Rigid Printed Boards
MIL-DTL-32648	Zinc Nickel Plating, Low Hydrogen Embrittlement Electro-Deposition
MIL-DTL-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-PRF-16173	Corrosion preventive compound, solvent cutback, cold-application
MIL-PRF-23377	Primer coatings: epoxy, high-solids
MIL-PRF-680	Degreasing Solvent
MIL-PRF-85285	Coating: Polyurethane, Aircraft and Support Equipment
MIL-PRF-85582	Primer Coatings: Epoxy, Waterborne
MIL-PRF-8625	Anodic Coatings for Aluminum and Aluminum Alloys
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-1501	Chromium Plating, Low Embrittlement, Electrodeposition
MIL-STD-865	Selective (Brush Plating), Electrodeposition.
MIL-STD-866	Grinding of Chrome Plated Steel and Steel Parts Heat Treated to 180,000 PSI or Over
MIL-STD-867	Temper Etch Inspection
MIL-STD-868	Nickel Plating, Low Embrittlement, Electrodeposition
MIL-STD-870	Cadmium Plating, Low Embrittlement, Electrodeposition
SAE AMS2175	Castings, Classification and Inspection of
SAE AMS2300	Steel Cleanliness, Premium Aircraft Quality Magnetic Particle Inspection Requirements
SAE AMS2430	Shot Peening, Automatic
SAE AMS2431/1	Peening Media (ASR) Case Steel Shot, Regular Hardness (45 to 52 HRC)
SAE AMS 2431/2	Peening Media (ASH) Cast Steel Shot, High Hardness (55 to 62 HRC)
SAE AMS2431/3	Peening Media (AWCR) Conditioned Carbon Steel Cut Wire Shot, Regular Hardness (45 to 52 HRC)

SAE AMS2431/4	Peening Media (AWS) Conditioned Stainless Steel Cut Wire Shot
SAE AMS2431/7	Peening Media Ceramic Shot
SAE AMS2431/8	Peening Media (AWCH) Conditioned Carbon Steel Cut Wire Shot, High Hardness (55 to 62 HRC)
SAE AMS2460	Plating, Chromium
SAE AMS2700	Passivation of Corrosion Resistant Steels
SAE AMS2759/1	Heat Treatment of Carbon and Low-Allow Steel Parts Minimum Tensile Strength Below 220 ksi (1517 Mpa)
SAE AMS2759/2	Heat Treatment of Low-Alloy Steel Parts Minimum Tensile Strength 220 ksi (1517 MPa) and Higher
SAE AMS2770	Heat Treatment of Wrought Aluminum Alloy Parts
SAE AMS2771	Heat Treatment of Aluminum Alloy Castings
SAE AMS2772	Heat Treatment of Aluminum Allow Raw Materials
SAE AMS5922	Steel, Corrosion-Resistant, Bars, and Forgings
SAE AMS6257	Steel Bars, Forgings and Tubing 1.6Si-0.82Cr-1.8Ni-0.40Mo-0.08V (0.40-0.44C) Consumable Electrode Vacuum Remelted Normalized and Tempered
SAE AMS6322	Steel Bars, Forgings and Rings 0.50Cr-0.55Ni-0.25Mo (0.38-0.43C) (SAE 8740)
SAE AMS6325	Steel Bars and Forgings 0.50Cr-0.55Ni-0.25Mo (0.38-0.43C) (SAE 8740) Heat Treated 105 ksi (724 Mpa) Tensile Strength
SAE AMS6327	Steel Bars and Forgings 0.50Cr-0.55Ni-0.25Mo (0.38-0.43C) (SAE 8740) Heat Treated 125 ksi (862 Mpa) Tensile Strength
SAE AMS6411	Steel Bars, Forgings and Tubing 0.88Cr-1.8Ni-0.42Mo-0.08V (0.28-0.33C) (4330 Mod) Consumable Electrode Remelted
SAE AMS6414	Steel Bars, Forgings and Tubing 0.80Cr-1.8Ni-0.25Mo (0.38-0.43C) (SAE 4340) Vacuum Consumable Electrode Remelted
SAE AMS6415	Steel Bars, Forgings and Tubing 0.80Cr-1.8Ni-0.25Mo (0.38-0.43C) (SAE 4340)
SAE AMS6419	Steel Bars, Forgings and Tubing 1.6Si-0.82Cr-1.8Ni-0.40Mo-0.08V (0.40-0.45C) Consumable Electrode Vacuum Remelted
SAE AMS6427	Steel Bars, Forgings and Tubing 0.88Cr-1.8Ni-0.42Mo-0.08V (0.25-0.33C) (4330 Mod)
SAE AMS6484	Steel Bars, Forgings and Tubing 0.80Cr-1.8Ni-0.25Mo (0.38-0.43C) (SAE 4340) Normalized and Tempered
SAE AMS QQ-A-225/6	Aluminum Alloy, 2024, Bar, Rod, and Wire; Rolled, Drawn, or Cold Finished
SAE AMS QQ-A-225/9	Aluminum Alloy 7075, Bar, Rod, Wire, and Special Shapes; Rolled, Drawn, or Cold Finished
SAE AMS-A-22771	Aluminum Alloy Forgings, Heat Treated
SAE AMS-C-26074	Electroless Nickel Coatings
SAE AMS-F-7190	Forging, Steel, For Aircraft/Aerospace Equipment and Special Ordnance Applications
SAE AMS-H-6875	Heat Treatment of Steel Raw Materials
SAE AMS-QQ-A-367	Aluminum Alloy Forgings
SAE AMS-QQ-N-290	Nickel Plating (Electrodeposited)
SAE AMS-QQ-P-416	Plating, Cadmium (Electrodeposited)
SAE AMS-STD-2154	Inspection, Ultrasonic, Wrought Metals, Process For

SAE AMS-STD-595	Colors Used in Government Procurement
SAE AS9100	(R) Quality Management Systems-Requirements for Aviation, Space and Defense Organizations.
SAE AS9132	(R) Data Matrix Quality Requirements for Parts Marking
STP51-400	Standard Machining Practices, Tolerances And Allowances
ZC-027L	Cor-Ban Corrosion Inhibiting Compound

3. ACRONYMS

AIA	Aerospace Industries Association
AMS	Aerospace Material Specification
AMSC	Acquisition Method Suffix Code
AS	Aerospace Standard
ASH	Cast Steel Shot, High Hardness
ASME	American Society of Mechanical Engineers
ASR	Cast Steel Shot, Regular Hardness
ASTM	American Society for Testing Materials
AWCH	Conditioned Carbon Steel Cut Wire Shot, High Hardness
AWCR	Conditioned Carbon Steel Cut Wire Shot, Regular Hardness
AWS	Conditioned Stainless Steel Cut Wire Shot
CAGE	Commercial And Government Entity
COTS	Commercial Off-the-Shelf
DCMA	Defense Contract Management Agency
F	Fahrenheit
FPI	Fluorescent Penetrant Inspection
FSCM	Federal Supply Code for Manufacturers
HRC	Hardness Rockwell C
HRI	Human Readable Information
ID	Inner Diameter
IUID	Item Unique Identification
KSI	Thousand per Square Inch
LPO	Landing per Overhaul
MIL	Military
MPI	Magnetic Particle Inspection
MRB	Material Review Board
MRI	Machine Readable Information
NAS	National Aerospace Standard
NASM	National Aerospace Standard Material
OD	Outer Diameter
POC	Point Of Contact
PRF	Performance

SAE	Society of Automotive Engineers
SCSI	Stress Corrosion Susceptibility Inspection
SQS	Source Qualification Statement
STD	Standard
USAF	United States Air Force
UTS	Ultimate Tensile Strength

4. DRAWING INTERPRETATION

4.1. **Surface Roughness** per ASME B46.1.

4.2. Deleted. Reference original drawing requirement for **Dimension and Tolerance**.

4.3. Deleted. Reference original drawing requirement for **Drawing Interpretation**.

5. MRB DISPOSITIONS

5.1. For Air Force internally coded AMSC 'G' and 'C' items:

5.1.1. USAF Landing Gear Systems Engineering retains all rights to review and accept **MRB** dispositions prior to shipment of any discrepant item. All deviations, minor (Class II) and major (Class I), from the engineering drawing package shall be submitted for MRB disposition. Prior to contract award, the contractor shall certify to the Government in writing full compliance with manuals, specifications, and standards called out and required for the manufacture of this contracted landing gear component/assembly. Contractor is responsible to completely search these manual, specifications, and standards and fully understand the requirements necessary to manufacture landing gear components. Any questions can be forwarded to USAF Landing Gear Systems Engineering. If component is designated as CSI, all variations in the manufacturing process after first article approval requires concurrence from USAF Landing Gear Systems Engineering.

5.2. For Air Force internally coded AMSC 'R' Brake items (stator/rotor disks, brake heat sinks or complete brake assemblies):

5.2.1. USAF Landing Gear Systems Engineering retains all rights to review and accept **MRB** dispositions of discrepant items. The supplier is responsible for maintaining the approved configuration to the original certification baseline performance specification requirements. The supplier may be required to validate the baseline performance requirements for major changes, as requested by the procuring activity. All deviations, minor (Class II) and major (Class I), from the engineering drawing package shall be submitted to the procuring activity. All Major changes shall require approval of the procuring activity prior to shipment. When identified, all Minor deviations shall be submitted to the appropriate contracting agency and electronically to 417SCMS.GUEA-ETAR.WORKFLOW@us.af.mil. The procuring activity shall have final authority to determine change classifications as Major/Minor if there is a disagreement with the supplier assigned classification. A Major change is defined as any

change that may affect the form, fit, or function of the component or assembly. If the supplier or DCMA inspectors are unsure if the change should be classified as major/minor, the deviation/waiver shall be submitted to the procuring activity for disposition. Major change examples include, but are not limited to: changes to rotor/stator lining compounds, processes, materials, sources of supply, or friction area; changes that may affect brake vibration or thermal transfer properties; changes that may affect reliability/maintainability; changes that may affect LPOs. Prior to contract award, the contractor shall certify to the Government in writing full compliance with manuals, performance specifications, and standards required for the manufacture of the contracted items. If component is designated as CSI, all variations in the manufacturing process after first article approval requires concurrence from USAF Landing Gear Systems Engineering.

5.3. For all other Air Force internally AMSC coded items:

5.3.1. USAF Landing Gear Systems Engineering retains all rights to review and accept **MRB** dispositions of discrepant items. All deviations, minor (Class II) and major (Class I), from the engineering drawing package shall be submitted to the procuring activity. All Major changes shall require approval of the procuring activity prior to shipment. When identified, all Minor deviations shall be submitted to the appropriate contracting agency and electronically to 417SCMS.GUEA-ETAR.WORKFLOW@us.af.mil. The procuring activity shall have final authority to determine change classifications as Major/Minor if there is a disagreement with the supplier assigned classification. A Major change is defined as any change that may affect the form, fit, or function of the component or assembly. If the supplier or DCMA inspectors are unsure if the change should be classified as major/minor, the deviation/waiver shall be submitted to the procuring activity for disposition. Prior to contract award, the contractor shall certify to the Government in writing full compliance with manuals, specifications, and standards required for the manufacture of this contracted items. Contractor is responsible to completely search these manual, specifications, and standards and fully understand the requirements necessary to manufacture landing gear components. Any questions can be forwarded to USAF Landing Gear Systems Engineering. If component is designated as CSI, all variations in the manufacturing process after first article approval requires concurrence from USAF Landing Gear Systems Engineering.

6. PART MARKING AND IDENTIFICATION

6.1. Full Label and Marking; Human Readable Information (HRI) etched on part and HRI/Machine Readable Information (MRI) label applied to part:

6.1.1. **IUID** shall be applied to each part per MIL-STD-130 and contain both HRI and MRI markings. Quality and technical requirements for both HRI and MRI shall be in accordance with SAE AS9132. The method of marking for the HRI shall be limited to electro-chemical etching, dot-peen, vibro-peen or micro-mil. The depth of each mark shall be from .003-.005 inches. The HRI mark shall include both the part number and serial number. The serial number will be limited to 16 alphanumeric characters including the vendor CAGE (FSCM) of the actual manufacturer, date of manufacture in the format MMYY, and a unique 4-digit number starting with 0001 in numerical order of manufacture. The HRI shall appear as “SN 9874701040001”. The height of each alphanumeric character in the HRI shall be a maximum of .125 inches. The

location of the HRI shall be per drawing specification. HRI/MRI shall be applied to a label per the requirements of drawing 200827953. Unless otherwise specified, the label configuration shall be per USAF drawing 200827953, dash number -01, -03 or -05 and dictated by component space requirements and manufacturer's choice. Unless otherwise specified, the label shall only be placed on the top coat of painted components. Unless otherwise specified, the label shall be located next to (preferred) or on top of (alternate) the same position as the etched HRI, as dictated by component size. Apply two topcoats of clear MIL-PRF-85285, Type I, Class H, polyurethane over label or apply 3M co. edge sealer, PN 4150 or 3950 over label.

6.2. Rubber Stamped; HRI rubber stamped on part and HRI/MRI label applied to part.

6.2.1. **IUID** shall be applied to each part per MIL-STD-130. The IUID shall contain HRI and MRI markings. Quality and technical requirements for both the MRI and HRI shall be in accordance with SAE AS9132. The method of marking for the HRI shall be limited to rubber stamping. The HRI mark shall include both the part number and the serial number. The serial number will be limited to 16 alphanumeric characters including the vendor cage (FSCM) of the contractor named on the contract, date of manufacture in the format MMYY, and a unique 4-digit number starting with 0001 in numerical order of manufacture. The HRI shall appear as "SN 9874701040001". The height of each alphanumeric character in the HRI shall be a maximum of .125 inches. Unless otherwise specified, the label configuration shall be per USAF drawing 200827953, dash number -01, -03 or -05 and dictated by component space requirements and manufacturer's choice. Unless otherwise specified, the label shall be placed on the top coat of painted components. Unless otherwise specified, the label shall be located next to (preferred) or on top of (alternate) the same position as the rubber stamped HRI, as dictated by component size. Apply two topcoats of clear MIL-PRF-85285, Type I, Class H, polyurethane over label or apply 3M co. edge sealer, PN 4150 or 3950 over label. The location of the IUID shall be identified on the drawing.

6.3. Marked and Tag or Bag; HRI etched on part and HRI/MRI label applied to supplemental tag or bag:

6.3.1. **IUID** shall be applied to each part per MIL-STD-130 and contain both HRI and MRI markings. Quality and technical requirements for both HRI and MRI shall be in accordance with SAE AS9132. The method of marking for the HRI shall be limited to electro-chemical etching, dot-peen, vibro-peen or micro-mil. The depth of each mark shall be from .003-.005 inches. The HRI mark shall include both the part number and serial number. The serial number will be limited to 16 alphanumeric characters including the vendor CAGE (FSCM) of the actual manufacturer, date of manufacture in the format MMYY, and a unique 4-digit number starting with 0001 in numerical order of manufacture. The HRI shall appear as "SN 9874701040001". The height of each alphanumeric character in the HRI shall be a maximum of .125 inches. The location of the HRI shall be per drawing specification. HRI/MRI label shall be applied to a tag, supplemental bag or other package that encloses the individual item. Label configuration shall be per USAF drawing 200827953, dash number -05 with the exception that Tesa Tape type material is not required; material for label is up to discretion of contractor.

6.4. HRI and MRI, Bag or Tag; HRI/MRI applied to supplemental tag or bag:

6.4.1. **IUID** shall be applied to each part per MIL-STD-130 and contain both HRI and MRI markings. Quality and technical requirements for both HRI and MRI shall be in accordance with SAE

AS9132. The HRI mark shall include both the part number and serial number. The serial number will be limited to 16 alphanumeric characters including the vendor CAGE (FSCM) of the actual manufacturer, date of manufacture in the format MMYY, and a unique 4-digit number starting with 0001 in numerical order of manufacture and shall appear as "SN 9874701040001". HRI/MRI marking shall be applied to a tag, supplemental bag or other package that encloses the individual item. Label configuration shall be per USAF drawing 200827953, dash number -05 with the exception that Tesa Tape type material is not required; material for label is up to discretion of contractor.

6.5. HRI Bag or Tag; HRI applied to supplemental tag or bag:

6.5.1. **IUID** shall be applied to each part per MIL-STD-130 for HRI markings. The HRI mark shall include both the part number and serial number. The serial number will be limited to 16 alphanumeric characters including the vendor CAGE (FSCM) of the actual manufacturer, date of manufacture in the format MMYY, and a unique 4-digit number starting with 0001 in numerical order of manufacture. The HRI shall appear as "SN 9874701040001". HRI marking shall be applied to a tag, supplemental bag or other package that encloses the individual item.

6.6. HRI Marked; HRI etched on part:

6.6.1. **IUID** shall be applied to each part per MIL-STD-130 for HRI markings. The method of marking for the HRI shall be limited to electro-chemical etching, dot-peen, vibro-peen or micro-mil. The depth of each mark shall be from .003-.005 inches. The HRI mark shall include both the part number and serial number. The serial number will be limited to 16 alphanumeric characters including the vendor CAGE (FSCM) of the actual manufacturer, date of manufacture in the format MMYY, and a unique 4-digit number starting with 0001 in numerical order of manufacture. The HRI shall appear as "SN 9874701040001". The height of each alphanumeric character in the HRI shall be a maximum of .125 inches. The location of the HRI shall be per drawing specification.

6.7. IUID not required:

6.7.1 **HRI** or **Part Marking** shall be applied to each part and shall contain part number and manufacture CAGE (FSCM). Location, size, permanency, legibility, and type shall be in accordance with drawing requirements or MIL-STD-130, if unspecified. If part cannot be physically marked at the recommended size requirements, information shall be applied to a bag that encloses the item, or to an identification tag securely fastened to the item per MIL-STD-130.

7. INSPECTION REQUIREMENTS

7.1. **Magnetic Particle Inspection** (MPI) per ASTM E1444. Use fluorescent type, full-wave direct current and wet continuous method. Examination sequence shall be performed AFTER operations which may cause or reveal indications. Operations include, but are not limited to, forging, heat treating, electroplating, forming, welding, grinding, straightening, machining, and proof loading. The following acceptance/rejection criteria may be used as an alternate to the original manufacturer criteria: NO RELEVANT INDICATIONS ALLOWED. The intent of NO

RELEVANT INDICATIONS ALLOWED is that the inspection is conducted at the required sensitivity level and there shall be no defects allowed. The inspector performing the inspections shall be certified to Level II with the inspection procedure developed by a Level III as specified in the AIA/NAS410.

7.2. **Fluorescent Penetrant Inspection** (FPI) per ASTM E1417, Type I, Method B, C, or D, Level 3 or 4. The following acceptance/rejection criteria may be used as an alternate to the original manufacturer criteria: NO RELEVANT INDICATIONS ALLOWED. The intent of NO RELEVANT INDICATIONS ALLOWED is that the inspection is conducted at the required sensitivity level and there shall be no defects allowed. The inspector performing the inspection shall be certified to Level II with the inspection procedure developed by a Level III as specified in AIA/NAS410.

7.3. For bushings or other items as determined by the USAF Landing Gear Systems Engineering, FPI per ASTM E1417, Type I, Method A, B, C, or D, Level 2, 3, or 4.

7.4. **Ultrasonic Inspect** per SAE AMS-STD-2154.

7.5. Stress corrosion susceptibility inspection **(SCSI)** per SAE AMS-QQ-A-367.

7.6. On parts Heat Treated 180 KSI UTS and above, any surfaces ground/machined after heat treat shall be **Temper Etch** inspected for burns per MIL-STD-867. No more than three successive inspections shall be performed without a waiver from USAF Landing Gear Systems Engineering. Grinding shall be per MIL-STD-866.

7.7. **Hardness Test** per ASTM E 18.

7.8. Barkhausen Inspection

7.8.1. **Barkhausen inspect** per USAF drawing 201227060, Type I, Grade A.

7.8.2. **Barkhausen inspect** per USAF drawing 201227060, Type I, Grade B.

8. HEAT TREATMENT REQUIREMENTS

8.1. **Heat Treat**

8.1.1. Heat treat steel raw materials to meet drawing requirements per SAE AMS-H-6875. Heat treat finished or semi-finished parts to meet drawing requirements per SAE AMS2759.

8.1.2. Deleted. Refer to paragraph 8.1.1.

8.1.3. Deleted. Refer to paragraph 8.1.1.

8.1.4. Heat treat aluminum alloy forgings per SAE AMS-A-22771.

8.1.5. Heat treat wrought aluminum alloy per SAE AMS2770.

8.1.6. Heat treat aluminum alloy castings per SAE AMS2771.

8.1.7. Heat treat aluminum alloy raw materials per SAE AMS2772.

8.2. **Stress Relief** per SAE AMS 2759/11

9. MATERIALS

9.1. 300M steel bars, forgings and tubing material per SAE AMS6257.

9.2. 300M steel bars, forgings and tubing material per SAE AMS6257 or SAE AMS6419.

9.3. Corrosion resistant steel (Ferrium S53) material per SAE AMS5922.

9.4. 4340 Steel bars, forgings and tubing material per SAE AMS6414, UTS as specified.

9.5. 4340 Steel material per SAE AMS6415 or SAE AMS6484, UTS as specified.

9.6. 4330 Mod Steel per SAE AMS6411, 220 KSI UTS.

9.7. 4330 Mod Steel per SAE AMS6427, UTS as specified.

9.8. Beryllium Copper material per ASTM B196. Temper or condition of material as specified on drawing.

9.9. 7075 Aluminum Alloy material per SAE AMS QQ-A-225/9. Temper or condition of material as specified on drawing.

9.10. 2024 Aluminum Alloy material per SAE AMS-QQ-A-225/6. Temper or condition of material as specified on drawing.

9.11. Material Cleanliness per SAE AMS 2300.

10. PROCESSING REQUIREMENTS

10.1. **Grind** to meet drawing requirements per MIL-STD-866. Belt Grinding per USAF Drawing 201414045 may be used as an alternate.

10.2. **Shot Peen** per SAE AMS2430. Unless otherwise specified on the drawing shot size shall be at the option of the contractor within the requirements of SAE AMS2430. A maximum surface area of 20% is authorized for manual peening per SAE 2430 for repair and touch-up or when part geometry is such that automated peening cannot provide full coverage in required areas. Unless otherwise specified on the drawing, the following criteria shall be used for shot intensity and material:

10.2.1. Steels under 200 ksi: 0.008A to 0.012A for 0.090 to .375 inch thick and 0.012A to 0.016A over .375 inch thick. Use steel shot per SAE AMS 2431/1, 2431/3, or 2431/4.

10.2.2. Steels of 200 ksi and Titanium Alloys: 0.006A to 0.010A for over 0.090 inch thick. Use steel shot per SAE AMS 2431/2, 2431/8, or ceramic shot per SAE AMS 2431/7.

10.2.3. Aluminum Alloys: 0.006A to 0.010A for 0.090 to 0.0375 inch thick, 0.010A to 0.014A for over 0.375 inch thick. Use steel shot per SAE AMS 2431/1, 2431/3 or 2431/4.

10.3. **Drill, Ream, and Hone** using published industry standards, if none exist, then a process that has been created and implemented successfully with documented evidence using SAE AS9100 guidelines may be used. Chemical, electrical, or electrochemical hole producing methods shall not be used as a final surface producing method on holes that cannot be Temper Etch inspected per MIL-STD-867 without prior approval from USAF Landing Gear Systems Engineering.

10.4. **In-Process Cleaning** shall be accomplished per MIL-PRF-680.

10.5. **Threads**. Unless otherwise specified, use 10.5.1. Unless otherwise specified, inspect threads per FED-STD-H28/20 Method 22.

10.5.1. Threads per SAE AS 8879, Category 1.

10.5.2. Threads per SAE AS 8879, Category 2. Unless otherwise specified, Category 2 requirements, shall apply to threads larger than 1.00 inches in diameter.

10.6. **Swage** or **Stake** per NAS 0331.

10.7. **Safety wire** per AIA/NAS NASM33540.

10.8. For new design, **Machine** using published industry standards, if none exist then a process that has been created and implemented successfully with documented evidence using SAE AS9100 guidelines may be used. For existing design, refer to original drawing requirements.

10.9. **Fabricate** using published industry standards, if none exist then a process that has been created and implemented successfully with documented evidence using SAE AS9100 guidelines may be used.

10.10. **Form** using published industry standards, if none exist then a process that has been created and implemented successfully with documented evidence using SAE AS9100 guidelines may be used.

11. FINISHING REQUIREMENTS

11.1. **LHE Zn-Ni Plate**

11.1.1. LHE Zn-Ni Plate per MIL-DTL-32648, Type II, Class 1. See paragraph 11.1.4 for LHE Zn-Ni Plate touch-up.

11.1.2. LHE Zn-Ni Plate per MIL-DTL-32648, Type II, Class 2. See paragraph 11.1.4 for LHE Zn-Ni Plate touch-up. Bushings, bolts, and other small components processed in batches may be plated by Voltage in lieu of Amperage. Voltage shall be set at a level that will deposit the

required plating thickness. Resulting plating shall pass all finish quality inspections. Fasteners exceeding 180 KSI-UTS shall not be barrel plated.

11.1.3. LHE Zn-Ni Plate per MIL-DTL-32648, Type II, Class 3. See paragraph 11.1.4 for LHE Zn-Ni Plate touch-up.

11.1.4. Unless otherwise noted, and if all other drawing requirements are met, touch-up to LHE Zn-Ni Plated surfaces may be performed using **Brush Plate LHE Zn-Ni** per MIL-DTL-32648 as needed for touch-up areas where mechanical damage or blending has occurred.

11.2. **Cad Plate**

11.2.1. Cadmium Plate per MIL-STD-870, Type II, Class 1. See paragraph 11.2.5 for Cadmium Plate touch-up.

11.2.2. Cadmium Plate per MIL-STD-870, Type II, Class 2. See paragraph 11.2.5 for Cadmium Plate touch-up.

11.2.3. Cadmium Plate per MIL-STD-870, Type II, Class 3. See paragraph 11.2.5 for Cadmium Plate touch-up.

11.2.4. Cadmium Plate per SAE AMS-QQ-P-416, Type II, Class 3. (Non-ferrous materials or steels below 180 ksi UTS)

11.2.5. Unless otherwise noted, and if all other drawing requirements are met, touch-up to Cadmium Plated surfaces may be performed using **Brush Cad Plate** per MIL-STD-865 in areas where mechanical damage or blending has occurred.

11.3. **Chrome Plate**

11.3.1. Chromium Plate per MIL-STD-1501, Type I, Class 1.

11.3.2. Chromium Plate per MIL-STD-1501, Type I, Class 2.

11.3.3. Chromium Plate per MIL-STD-1501, Type II, Class 2.

11.3.4. On steel parts heat treated to less than 180 KSI UTS, Chromium plate per AMS 2460 or MIL-STD-1501. Parts shall be shot peened in accordance with SAE AMS 2430 prior to plating.

11.4. **Anodize**

11.4.1. Anodize per MIL-PRF-8625, Type II, Class 1. Sodium or potassium dichromate seal is required. See paragraph 11.8 for Anodize touch-up.

11.4.2. Anodize per MIL-PRF-8625, Type III, Class 1. Sealing is prohibited.

11.4.3. Anodize per MIL-PRF-8625, Type III, Class 1. Sodium or potassium dichromate seal is required.

11.5. **Passivate**

11.5.1. Passivate per AMS 2700, Method 1, Type II. Cleaning prior to passivation shall be non-embrittling, use mechanical means, alkaline or electrolytic alkaline descaling (anodic only), or molten salt bath methods. Acid pickling is not permitted.

11.5.2. Passivate per ASTM A967.

11.6. **Nickel Plate**

11.6.1. Electroless Nickel Plate per MIL-C-26074.

11.6.2. Electrolytic Nickel Plate per MIL-STD-868, Type I.

11.6.3. Electrolytic Nickel Plate per MIL-STD-868, Type II.

11.6.4. On steel parts heat treated to less than 180 KSI UTS, Electrolytic Nickel Plate per AMS-QQ-C-290, Class 2.

11.6.5. Nickel Plate per SAE AMS 2404, Class 1

11.7. **Prime/Paint**

11.7.1. **Primer Wash** not required.

11.7.2. Apply one coat epoxy waterborne **Primer** per MIL-PRF-85582, Type I, Class C2 or N. Alternate one coat of epoxy polyamide primer per MIL-PRF-23377, Type I, Class C2.

11.7.3. Apply two **Paint** topcoats polyurethane per MIL-PRF-85285, Type I or Type IV, color number 17925 (white) per SAE AMS-STD-595.

11.8. **Chemical-Conversion** Coating per MIL-DTL-5541, brush or dip. Unless otherwise noted, if all drawing requirements are met, touch-up to Anodize, Type II surfaces may be performed using brush Chemical-Conversion Coating up to 5% of part surface

11.9. **Phosphate** coating per MIL-DTL-16232. Unless otherwise specified, use Type M, Class 2.

12. BUSHING INSTALLATION REQUIREMENTS

12.1. **Bushing Install**.

12.1.1. For general sub-zero bushing installation use the following:

12.1.1.1. The bushing installations shall be accomplished in such a manner as to avoid damage to the finish on the ID of the housing into which the bushing is installed, or the finish of the OD of the bushing. Forced installation of sub-zero installations, such as the use of a press or hammer is not permitted, and is not acceptable. A small non-metallic hammer may be used to tap the bushing into alignment with the housing bore, or to seat the bushing.

12.1.1.2. Prior to bushing installation, the parts and housing bore shall be cleaned with cleaning solvent to remove all contamination.

12.1.1.3. Liquid Nitrogen shall be used for all sub-zero installations unless some other sub-zero coolant is specified, and approved by USAF Landing Gear Systems Engineering. The soak time of the bushing in the Liquid Nitrogen shall be sufficient to allow the bushing to reach the same temperature as the coolant.

12.1.1.4. The bushing shall be installed into the housing immediately upon removal from the coolant with an absolute minimum of lost time. Trial runs shall be accomplished as necessary to minimize installation time which should be in the order of about seven (7) seconds maximum.

12.1.1.5. It may occasionally be necessary to heat the housing into which the bushing is to be installed, in addition to sub-zero cooling of the bushing. Detail parts in process will not have paint or sealant or other organic material applied prior to heating; the parts shall be heated by the use of radiant heat techniques, such as thermal blankets, infrared lamps etc., to no more than a maximum temperature of 250 deg. F. Temperature measuring devices shall be used to monitor heat and shall be located on areas of the part expected to reach maximum temperature. No scaling, oxidation, or corrosion shall be permitted.

12.1.1.6. Cor-Ban 27L (Zip-Chem ZC-027L), hereafter referred to as corrosion inhibiting compound, per BMS 3-38 (Boeing CAGE 81205), manufactured by Zip-Chem Products, 400 Jarvis Dr., Morgan Hill, CA 95037 (CAGE 8E913), shall be used as noted in the following two paragraphs.

12.1.1.7. Bushings without flanges shall be installed into housing bore which has received a light coat of corrosion inhibiting compound. Corrosion inhibiting compound shall not obstruct grease zerk passages. Install shrunken bushing and wipe off any excess compound that may have extruded around the periphery of both ends of the bushings.

12.1.1.8. Bushing with flanges shall be installed in a similar manner, except corrosion-inhibiting compound shall also be applied to face of lug under flange. The compound shall be applied in such a manner as to ensure complete coverage of inside face of bushing flange when bushing is installed. Wipe off any excess compound around periphery of bushing flange forming a bead. Wipe any excess compound from other end of bushing also.

12.2. **Loctite** bushing install:

12.2.1. Install bushings per paragraph 12.1.1 using **Loctite**, 609 (Green), AN0411 per ASTM D 5363 in lieu of corrosion inhibiting compound (Cor-Ban 27L).

12.3. **Sealer** bushing install:

12.3.1. Install bushings per paragraph 12.1.1, except using **Sealer** per MIL-PRF-81733, Type IV-12, Class 1 Grade A in lieu of corrosion inhibiting compound (Cor-Ban 27L).

12.4. **Fillet Seal**

12.4.1.1. Install bushings per paragraph 12.1.1.

12.4.1.2. After bushing normalizes, clean all surfaces that will come/or have come in contact with corrosion inhibiting compound (Cor-Ban 27L) in accordance with specification SAE

AIR4069 paragraph 5. Seal around entire periphery of bushing using **Sealer** per MIL-PRF-81733, Type IV-12, Class 1 Grade A.

13. FORGING INFORMATION

13.1. Forge and Inspect

13.1.1. Forge and inspect steel parts to meet drawing requirements per SAE AMS- F-7190.

13.1.2. Forge and inspect aluminum parts to meet drawing requirements per SAE AMS-A-22771.

13.2. Forging Requirements

13.2.1. The contractor may procure forgings from sources pre-approved by USAF Landing Gear Systems Engineering or may elect to develop new or additional sources per instructions in section 13.2.2 and the following:

13.2.1.1. If forgings are procured from sources approved by USAF Landing Gear Systems Engineering, original certified forging procedures, equipment and dies/tooling shall be used. Any alteration to procedures, equipment or dies/tooling at an existing source will be qualified per Section 13.2.1.3 and 13.2.1.4. Prior to contract award, the detailed part bidder shall provide verification (e.g., forging quote) to the Government that the certified dies and procedures are available for their use in the event they are the successful bidder.

13.2.1.2. Forging source and the location of the dies may be listed on the drawing, if known, in the following format:

1. Forging Drawing:
2. Die #:
3. Location of Dies:
4. CAGE:

13.2.1.3. If the forging source is unknown or the contractor wishes to develop additional sources, or new equipment/tooling/dies are required at an existing source, the contractor shall advise the Government in writing of their intent prior to contract award. The contractor shall not proceed without the express consent of the Government procuring agency. See Section 13.2.2 for new forging die qualification requirements.

13.2.1.4. Prior to production, forging lot qualification shall be accomplished as specified on the forging drawing and SAE AMS-F-7190 for steel forgings and SAE AMS-A-22771 for aluminum forgings. The detailed part contractor shall assure that this has been accomplished by the forging source and retain in their records for no less than 10 years. USAF Landing Gear Systems Engineering reserves the right to review this documentation as needed.

13.2.2. New Forging Source/Die Qualification Requirements:

13.2.2.1. The vendor will select a forging source, act as the primary contractor and direct the orderly development of forging dies, techniques, and practices needed to ensure that the required

repetitive quality can be expected. The Government, or any contractor with a Government contract for manufacture of the component, shall have unlimited use of the dies developed under this contract. The contractor shall inform the forging source in writing, at the same time the order for the dies is placed, that the Government, or any contractor with a Government contract for manufacture of the component, has unlimited use right of the dies and forward a copy of this letter to the Government Contracting Officer.

13.2.2.2. Forging qualification shall be accomplished as specified by forging drawing and the requirements of the associated forging specification requirements. The forging source shall be directed to develop dies, establish the forging sequence, and other processing procedures in compliance with the required drawing and specifications. The vendor shall ensure the forging source completes all the required forging development testing and inspections and that the developed forging meets the specified standards.

13.2.2.3. The contractor shall submit the complete qualification package demonstrating full compliance for final review and approval to the Government Contracting Officer. The 417 SCMS/GUEA (Landing Gear Engineering) must approve the forging dies and forging process before any production forging is made. The qualification package will be evaluated by the 417 SCMS/GUEA (Landing Gear Engineering) to ensure the specified standards are met.

13.2.2.4. Once submitted, the qualification package will become the property of the Government. The Government shall have full access to the qualified forging source and unlimited “no charge” use-rights of the certified forging dies and procedures for the life of the Weapon System. The contractor will notify 417 SCMS/GUEA (Landing Gear Engineering) of the location (name, address, die number, POC) of the qualified forging source. A copy of the letter sent to the forging source, stating “the Government, or any contractor with a Government contract for manufacture of the component, shall have unlimited use-rights to the forging dies,” must be included in the forging qualification package.

13.2.2.5. All proposed modifications, disposals, or dispositions of the forging dies and procedures shall be authorized through the 417 SCMS/GUEA (Landing Gear Engineering) prior to disposition.

14. CASTING INFORMATION

14.1. Casting Requirements

14.1.1. The contractor may procure castings from sources pre-approved by USAF Landing Gear Systems Engineering or may elect to develop sources per the following instructions:

14.1.1.1. If castings are procured from sources approved by USAF Landing Gear Systems Engineering, original certified casting procedures and tools shall be used. Any alterations to procedures, equipment or tools at an existing source will be qualified per Section 14.1.1.3 and 14.1.1.4. Prior to contract award, the detailed part bidder shall provide verification (e.g., casting quote) to the Government that the certified tooling and casting procedures are available for their use in the event they are the successful bidder.

14.1.1.2. Casting source and the location of the tools shall be listed, if known, on the drawing as follows:

1. Casting Drawing:
2. Location of casting Dies:
3. Cage:

14.1.1.3. If the casting source is unknown or the contractor wishes to develop additional sources, the contractor shall advise the Government in writing of their intent to procure new casting tools and the proposed casting source prior to contract award. The contractor shall not proceed without the express consent of the Government procuring agency (see USAF Landing Gear Systems Engineering Casting SQS for further information on casting qualification requirements). The Government shall have unlimited use of the tools developed under this contract. The contractor shall inform the casting source in writing, at the same time the order for the tools is placed, that the Government has unlimited use right of the tools and forward a copy of this letter to the Government Contracting Officer.

14.1.1.4. Prior to production, casting lot qualification shall be accomplished as specified on the casting drawing and SAE AMS-2175. The detailed part contractor shall assure that this has been accomplished by the casting source and retain in their records for no less than 10 years. USAF Landing Gear Systems Engineering reserves the right to review this documentation as needed.

14.1.2. Cast and inspect parts to meet drawing requirements per SAE AMS-2175.

15. WEAPON SYSTEM SPECIFIC REQUIREMENTS

15.1. **A-10 Weapon System**

15.1.1. Interchangeable Specification MIL-I-8500 is not required for manufacture.

15.2. **B-1 Weapon System**

15.2.1. Drawing 1881A8000 is not required for manufacture and will not be supplied.

15.2.2. RI DESIGN SPEC. L287C2036 is not required for manufacture and will not be supplied.

15.2.3. L287C2001 is not required for manufacture and will not be supplied.

15.2.4. L000024 is not required for manufacture and will not be supplied.

15.3. **B-2 Weapon System**

15.3.1. D6-5000 (Finish Codes), EAA5320-006 (Standard Parts), DAA8712V002 (Material Substitution) are not required for manufacture and will not be provided.

15.4. **B-52 Weapon System**

15.4.1. D2-5000(Finish Codes) are not required for manufacture and will not be provided.

15.5. **C-5 Weapon System**

15.5.1. Machine to meet drawing requirements per STP51-400 in lieu of DS30003.

15.5.2. DS 5025 (Abbreviations), X995 (Fatigue Test), and X999 (Static Test) are not required for manufacture and will not be provided

15.5.3. DS30000 is not required for manufacture and will not be provided

15.5.4. Interface control information is not required for manufacture and associated specifications will not be provided.

15.6. **C-130 Weapon System**

15.7. **E-3 Weapon System**

15.8. **F-4 Weapon System**

15.9. **F-5 Weapon System**

15.10. **F-15 Weapon System**

15.10.1. Specification 40M114 is not required and will not be provided.

15.10.2. Finish specification 68A900000 is not required and will not be provided.

15.11. **F-16 Weapon System**

15.11.1. Protect parts during processing by applying MIL-PRF-32033, any Type and Class. For final shipment, apply corrosion preventative compound per MIL-PRF-16173, Class II, Grade 2 or 3 to all unprotected surfaces to include chrome plating. Application may be brush, dip, or spray. Ensure all unprotected surfaces are completely covered prior to final packaging and shipment.

15.12. **KC-135 Weapon System**

15.12.1. Dimensional Inspection/Acceptance & Tool Point Control per BSS7015 in lieu of BAC5405.

15.12.2. The Boeing specification for Protective Finish Codes, D2-5000 (or 2-5000) is not required for manufacture and will not be provided (Note: Finish Codes will be required/superseded individually).

15.12.3. Rivet per BAC5004 is not required for manufacture and will not be provided.

15.12.4. Apply Temporary Corrosion Protection during handling, transportation, and storage per MIL-PRF-16173, Class II, in lieu of Finish Code F-1.10.

15.13. **T-38 Weapon System**

15.14. **Antiskid Systems**

15.14.1. **Lead-Free Usage**

15.14.1.1. The use of lead-free solder or lead-free plated components in military electronic products is considered a flight safety and national security concern. For this reason the US Air Force wants to be notified when lead-free components and manufacturing processes have been implemented. As part of satisfactory compliance with the requirements of this contract the US Air Force requires notification on a no-cost basis when any of the following conditions exist:

15.14.1.1.1. Commercial Off-the-Shelf (COTS) or any other electronic components that contain lead-free solder or lead-free plated components are used in the end item.

15.14.1.1.2. Any lead-free component or part used to manufacture the end item that is not identified with a separate part number or designation.

15.14.2. **Lead-Free Labeling**

15.14.2.1. If no lead-free soldered, lead-free plated COTS or any other lead-free electrical or electronics component exists in the manufacturing end item, the contractor shall provide written certification of compliance as a deliverable with the contract.

15.14.2.1.1. Use industry standard IPC-1066, “Marking, Symbols and Labels for identification of Lead-Free and Other Reportable Materials in Lead-Free Assemblies, Components and Devices.”

15.14.2.1.2. Include the program engineer’s evaluation of the purchasing/repair item for any “Lead-Free” military part(s) in reference to its reliability, performance and compatibility for the system.

15.14.3. Use IPC-2221 and IPC-6012 in lieu of IPC-D-275.