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APPLICATION		REVISIONS			
NEXT ASSY	USED ON	REV	DESCRIPTION	DATE	APPROVED
~	Landing Gear	A	See EO NO. 15A7142-H	20150622	N. DAGSEN
		B	SEE EO NO. 17A0716-H	180418	LZPEX-HILL
		C	SEE EO NO. 19A0198-H	190528	LZPEX-HILL

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON: FRACTIONS DECIMALS ANGLES ±  .XX±  ±  XXX± 	DFTSMN STEVEN THORNE	DATE 141103	U.S. AIR FORCE		
	CHKR RODNEY GOULD	150126	TITLE LANDING GEAR REQUIREMENTS DOCUMENT		
	MATL ENGR N/A	-			
	PROJ ENGR STEVEN THORNE	141103	SIZE A		
CURRENT CAGE CODE	A.F. AUTHENTICATION RON MONTGOMERY	141110			
	RELEASE Scott Kingsford	150126	CAGE CODE 98747		DWG NO. 201416605
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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.

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Document Number

200827953

201027456

201414045

29 CFR 1910

AIA/NAS NAS0331

AIA/NAS NASM33540

AIA/NAS410

ASME B46.1

ASME Y14.5

ASME Y14.100

ASTM B196

ASTM E1417

ASTM E1444

BMS 3-38

BAC5405

FED-STD-595

IPC-1066

IPC-2221

IPC-6012

MIL-A-8625

MIL-DTL-5541

MIL-PRF-16173

MIL-PRF-23377

MIL-PRF-680

MIL-PRF-85285

MIL-PRF-85582

MIL-STD-130

MIL-STD-1501

MIL-STD-866

MIL-STD-867

MIL-STD-868

Title

Label, Unique Identification (IUID), Landing Gear

*Low Hydrogen Embrittlement Plating Process Specification
Zinc-Nickel (Gamma Zn)*

*Grinding, Belt, Tungsten Carbide Coatings, Hard Chrome
Platings, High Strength Steel*

Toxic and Hazardous Substances

Bearing Installation and Retention by Swaging or Staking

*Safety Wiring, Safety Cabling, Cotter Pinning, General Practices
For*

*NAS Certification and Qualification of Nondestructive Test
Personnel*

Surface Texture (Surface Roughness, Waviness, and Lay)

Dimensioning and Tolerancing

Engineering Drawing Practices

Standard Specification for Copper-Beryllium Alloy Rod and Bar

Standard Practice for Liquid Penetrant Testing

Standard Practice for Magnetic Particle Testing

Corrosion Inhibiting Compounds

*Process Specification for the Dimensional Acceptance of
Forgings and Castings*

Colors Used in Government Procurement

*Marking, Symbols and Labels for Identification of Lead-Free and
Other Reportable Materials in Lead-Free Assemblies,
Components and Devices*

Generic Standard on Printed Board Design

*Qualification and Performance Specification for Rigid Printed
Boards*

Anodic Coatings for Aluminum and Aluminum Alloys

*Chemical Conversion Coatings on Aluminum and Aluminum
Alloys*

*Corrosion preventive compound, solvent cutback, cold-
application*

Primer coatings: epoxy, high-solids

Degreasing Solvent

Coating: Polyurethane, Aircraft and Support Equipment

Primer Coatings: Epoxy, Waterborne

Identification Marking of U.S. Military Property

Chromium Plating, Low Embrittlement, Electrodeposition

*Grinding of Chrome Plated Steel and Steel Parts Heat Treated
to 180,000 PSI or Over*

Temper Etch Inspection

Nickel Plating, Low Embrittlement, Electrodeposition

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MIL-STD-870	<i>Cadmium Plating, Low Embrittlement, Electrodeposition</i>
SAE AMS2175	<i>Castings, Classification and Inspection of</i>
SAE AMS2300	<i>Steel Cleanliness, Premium Aircraft Quality Magnetic Particle</i>
	<i>Inspection Requirements</i>
SAE AMS2430	<i>Shot Peening, Automatic</i>
SAE AMS2431/1	<i>Peening Media (ASR) Case Steel Shot, Regular Hardness (45</i>
	<i>to 52 HRC)</i>
SAE AMS 2431/2	<i>Peening Media (ASH) Cast Steel Shot, High Hardness (55 to 62</i>
	<i>HRC)</i>
SAE AMS2431/3	<i>Peening Media (AWCR) Conditioned Carbon Steel Cut Wire</i>
	<i>Shot, Regular Hardness (45 to 52 HRC)</i>
SAE AMS2431/4	<i>Peening Media (AWS) Conditioned Stainless Steel Cut Wire</i>
	<i>Shot</i>
SAE AMS2431/7	<i>Peening Media Ceramic Shot</i>
SAE AMS2431/8	<i>Peening Media (AWCH) Conditioned Carbon Steel Cut Wire</i>
	<i>Shot, High Hardness (55 to 62 HRC)</i>
SAE AMS2460	<i>Plating, Chromium</i>
SAE AMS2700	<i>Passivation of Corrosion Resistant Steels</i>
SAE AMS2759/1	<i>Heat Treatment of Carbon and Low-Allow Steel Parts Minimum</i>
	<i>Tensile Strength Below 220 ksi (1517 Mpa)</i>
SAE AMS2759/2	<i>Heat Treatment of Low-Alloy Steel Parts Minimum Tensile</i>
	<i>Strength 220 ksi (1517 MPa) and Higher</i>
SAE AMS2770	<i>Heat Treatment of Wrought Aluminum Alloy Parts</i>
SAE AMS2771	<i>Heat Treatment of Aluminum Alloy Castings</i>
SAE AMS2772	<i>Heat Treatment of Aluminum Allow Raw Materials</i>
SAE AMS5922	<i>Steel, Corrosion-Resistant, Bars, and Forgings</i>
SAE AMS6257	<i>Steel Bars, Forgings and Tubing 1.6Si-0.82Cr-1.8Ni-0.40Mo-</i>
	<i>0.08V (0.40-0.44C) Consumable Electrode Vacuum Remelted</i>
	<i>Normalized and Tempered</i>
SAE AMS6322	<i>Steel Bars, Forgings and Rings 0.50Cr-0.55Ni-0.25Mo (0.38-</i>
	<i>0.43C) (SAE 8740)</i>
SAE AMS6325	<i>Steel Bars and Forgings 0.50Cr-0.55Ni-0.25Mo (0.38-0.43C)</i>
	<i>(SAE 8740) Heat Treated 105 ksi (724 Mpa) Tensile Strength</i>
SAE AMS6327	<i>Steel Bars and Forgings 0.50Cr-0.55Ni-0.25Mo (0.38-0.43C)</i>
	<i>(SAE 8740) Heat Treated 125 ksi (862 Mpa) Tensile Strength</i>
SAE AMS6411	<i>Steel Bars, Forgings and Tubing 0.88Cr-1.8Ni-0.42Mo-0.08V</i>
	<i>(0.28-0.33C) (4330 Mod) Consumable Electrode Remelted</i>
SAE AMS6414	<i>Steel Bars, Forgings and Tubing 0.80Cr-1.8Ni-0.25Mo (0.38-</i>
	<i>0.43C) (SAE 4340) Vacuum Consumable Electrode Remelted</i>
SAE AMS6415	<i>Steel Bars, Forgings and Tubing 0.80Cr-1.8Ni-0.25Mo (0.38-</i>
	<i>0.43C) (SAE 4340)</i>
SAE AMS6419	<i>Steel Bars, Forgings and Tubing 1.6Si-0.82Cr-1.8Ni-0.40Mo-</i>
	<i>0.08V (0.40-0.45C) Consumable Electrode Vacuum Remelted</i>

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SAE AMS6427	<i>Steel Bars, Forgings and Tubing 0.88Cr-1.8Ni-0.42Mo-0.08V (0.25-0.33C) (4330 Mod)</i>
SAE AMS6484	<i>Steel Bars, Forgings and Tubing 0.80Cr-1.8Ni-0.25Mo (0.38-0.43C) (SAE 4340) Normalized and Tempered</i>
SAE AMS QQ-A-225/6	<i>Aluminum Alloy, 2024, Bar, Rod, and Wire; Rolled, Drawn, or Cold Finished</i>
SAE AMS QQ-A-225/9	<i>Aluminum Alloy 7075, Bar, Rod, Wire, and Special Shapes; Rolled, Drawn, or Cold Finished</i>
SAE AMS-A-22771	<i>Aluminum Alloy Forgings, Heat Treated</i>
SAE AMS-C-26074	<i>Electroless Nickel Coatings</i>
SAE AMS-F-7190	<i>Forging, Steel, For Aircraft/Aerospace Equipment and Special Ordnance Applications</i>
SAE AMS-H-6875	<i>Heat Treatment of Steel Raw Materials</i>
SAE AMS-QQ-A-367	<i>Aluminum Alloy Forgings</i>
SAE AMS-QQ-N-290	<i>Nickel Plating (Electrodeposited)</i>
SAE AMS-QQ-P-416	<i>Plating, Cadmium (Electrodeposited)</i>
SAE AMS-S-13165	<i>Shot Peening of Metal Parts</i>
SAE AMS-STD-2154	<i>Inspection, Ultrasonic, Wrought Metals, Process For</i>
SAE AS9132	<i>(R) Data Matrix Quality Requirements for Parts Marking</i>
STP51-400	<i>Standard Machining Practices, Tolerances And Allowances</i>
ZC-027L	<i>Cor-Ban Corrosion Inhibiting Compound</i>

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

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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. **Dimension and Tolerance** for new design/drawings only per ASME Y14.5. Use original drawing requirements for existing designs/drawings.
- 4.3. **Drawing Interpretation** for new design/drawings only in accordance with ASME Y14.100 including appendices B thru E. Use original drawing requirements for existing designs/drawings.

5. MRB DISPOSITIONS

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

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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. All Minor changes shall require courtesy copy to the procuring activity at the time of shipment. 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),

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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. All Minor changes shall require courtesy copy to the procuring activity at the time of shipment. 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. **UIID** 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 MMY, 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.

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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 MMY, 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 MMY, 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 serial number will be limited to 16 alphanumeric

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characters including the vendor CAGE (FSCM) of the actual manufacturer, date of manufacture in the format MMY, 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. **IID** 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 MMY, 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. **IID** 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 MMY, 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. IID 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. The following acceptance/rejection criteria

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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.
- 8.1.2. Heat treat steel parts with minimum tensile strength below 220 KSI UTS per SAE AMS2759/1.

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8.1.3. Heat treat of Low-Alloy steel parts with minimum tensile strength above 220 KSI UTS per SAE AMS2759/2.

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, 280 KSI UTS.

9.2. 300M steel bars, forgings and tubing material per SAE AMS6257 or SAE AMS6419, 280 KSI UTS.

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

9.4. 4340 Steel bars, forgings and tubing material per SAE AMS6414, 260 KSI UTS.

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.

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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. Shot peening intensity shall be as specified by the applicable drawing. The size of the shot shall be at the option of the contractor, within the requirements of SAE AMS2430 (unless otherwise specified on the drawing). For any approved areas of local rework after processing by SAE AMS 2430, localized areas, up to 20% can be processed per SAE AMS-S-13165. The following criteria should be used in selecting the shot material (unless otherwise specified on the drawing):
- 10.2.1. For steel parts heat treated to 200 KSI or above, use hard steel shot in the range 55-65 HRC (per SAE AMS 2431/2 or 2431/8), or ceramic shot with a hardness comparable to 57-63 HRC (per SAE AMS 2431/7).
- 10.2.2. For nonferrous metals and steel parts heat treated to values below 200 KSI, use standard hardness steel shot (per SAE AMS 2431/1, 2431/3, or 2431/4).
- 10.3. **Drill, Ream, and Hone** to meet drawing specifications, using best aircraft industry standards. 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.
- 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** to meet drawing requirements per best aircraft industry standards. For existing design, refer to original drawing requirements.
- 10.9. **Fabricate** to meet drawing requirements per best aircraft industry standards.
- 10.10. **Form** to meet drawing requirements per best aircraft industry standards.

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11. FINISHING REQUIREMENTS

11.1. LHE Zn-Ni Plate

11.1.1. LHE Zn-Ni Plate per USAF drawing 201027456, Type II, Class 1. Unless otherwise specified, Cadmium Plate per MIL-STD-870 can be used as an alternate to LHE Zn-Ni, using same type and class.

11.1.2. LHE Zn-Ni Plate per USAF drawing 201027456, Type II, Class 2. Unless otherwise specified, Cadmium Plate per MIL-STD-870 can be used as an alternate to LHE Zn-Ni, using same type and class.

11.1.3. LHE Zn-Ni Plate per USAF drawing 201027456, Type II, Class 3. Unless otherwise specified, Cadmium Plate per MIL-STD-870 can be used as an alternate to LHE Zn-Ni, using same type and class.

11.2. Cad Plate

11.2.1. Cadmium Plate per MIL-STD-870, Type II, Class 1.

11.2.2. Cadmium Plate per MIL-STD-870, Type II, Class 2.

11.2.3. Cadmium Plate per MIL-STD-870, Type II, Class 3.

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

11.3. 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-A-8625, Type II, Class 1. Sodium or potassium dichromate seal is required.

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

11.4.3. Anodize per MIL-A-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, color number 17925 (white) per FED-STD-595.

11.8. Chemical-Conversion Coating per MIL-DTL-5541, brush or dip.

12. **BUSHING INSTALLATION REQUIREMENTS**

12.1. **Bushing Install.**

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

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- 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

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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 the following instructions:

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

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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 USAF Landing Gear Systems Engineering Forging SQS for further information on forging qualification requirements). The Government 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 has unlimited use right of the dies and forward a copy of this letter to the Government Contracting Officer.

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.

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

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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

15.3. 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

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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. Apply corrosion preventative compound per MIL-PRF-16173.

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.

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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.

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