MIL-L-8552C
Amendment -2
10 DECEMBER 1968

Superseding
Interim Amendment -1
(USAF)
4 March 1966

MILITARY SPECIFICATION

LANDING GEAR, AIRCRAFT SHOCK ABSORBER (AIR-OIL TYPE)

This amendment forms a part of Military Specification MIL-L-8552C, 19 November 1965, and is mandatory for use by all Departments and Agencies of the Department of Defense.

Page 1, paragraph 1.2: Under Federal Specifications, add the following documents:

"QQ-A-367	Aluminum Alloy Forgings, Heat-Treated
QQ-P-416	Plating, Cadmium (Electrodeposited)"

Page 2, paragraph 1.2:

(a) Under Military Specifications, add the following documents:

"MIL-F-7179	Finishes and Coatings: General Specification for Protection of Aerospace Weapons Systems, Structures and Parts
MIL-F-7190	Forgings, Steel, for Aircraft and Special Ordnance Applications
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-C-8837	Coating, Cadmium (Vacuum Deposited)
MIL-T-9047	Titanium and Titanium-Alloy Bars, Forgings, and Forging Stock
MIL-A-22771	Aluminum Alloy Forgings, Heat Treated
MIL-HDBK-5	Metallic Materials and Elements for Flight Vehicular Structures"

(b) Under Standards, add the following:

"Federal

FED. TEST METHOD STD. NO. 151 Metals; Test Methods"

FSC 1620

(c) Under Military Standards, delete the following document:

"MIL-STD-10 Surface Roughness, Waviness, and Lay"

Page 3:

(a) Paragraph 2.2: Add the following:

"Society of Automotive Engineers, Inc.

AMS2300 — Premium Aircraft Quality Steel Cleanliness, Magnetic Particle Inspection Procedure
AMS2419 Cadmium-Titanium Alloy Plating

(Copies of the above publications may be obtained from the Society of Automotive Engineers, Inc., Two Pennsylvania Plaza, New York, New York 10001.)

United States of America Standards Institute

B46.1 - 1962 Surface Texture (Surface Roughness, Waviness, and Lay)

(Copies of the above publication may be obtained from the United States of America Standards Institute, 10 East 40th Street, New York, N.Y. 10007.)"

(b) Paragraphs 3.2, 3.2.1, and 3.2.2: Delete, and substitute:

"3.2 Materials. - Materials shall be as specified herein.

"3.2.1 Steel. - Approval shall be obtained from the procuring activity for the selection of material and heat treatment for all applications requiring tensile strength of 200,000 psi and above. All such steels shall conform to AMS2300. Include as justification data for selection: fatigue, stesss corrosion susceptibility, notch sensitivity and fracture toughness, longitudinal and transverse mechanical properties, hardenability, formability, fabrication considerations and availability. In addition, these data shall be compared with other possible candidate materials. Any steel components used shall be designed at high strength levels in accordance with the notch sensitivity of the material with provisions for rounded edges, gradual section changes, suitable grain flow and special handling to prevent surface damage during manufacture and assembly. Carbon and alloy steels shall be used within the hardenability limitations specified in table 2.3.0.1(a) and figure 2.3.0.1 of MIL-HDBK-5. The following precautions shall be observed:

(a) Tempering or use in the temper-brittle range for respective compositions shall be avoided. Steel heat treated to 180 ksi, or less, shall not have less than 15 ft./lbs. Charpy "V" notch impact resistance in the short transverse direction at -65° F testing temperature. Steel heat treated to strengths above 200 ksi shall have an average reduction of area for 5 specimens of not less than 20 percent, with no values less than 15 percent, in the short transverse direction. These specimens shall be cut from consumable remelted ingots produced from the first and last ingot of each air melt heat.

(b) The use of compositions which result in excessive hardenability shall not be used. Select hardenability sufficient to insure transformation on quenching to not less than 90 percent martensite at the center of maximum cross section.

(c) Quenched and tempered parts at temperatures higher than 50° F below the tempering temperature shall not be used.

(d) Materials shall be free from any zone of complete decarburization as determined microscopically on prepared sections. Partial decarburization to such extent that the increase in hardness from the surface to any point below the surface of an oil-hardened specimen does not exceed two points on the Rockwell A scale is acceptable. This test is not applicable to materials less than 0.025 inch in thickness.

(e) Whenever practicable, mechanical drilling, broaching, reaming, and deburring of holes in martensitic steel after hardening to strength levels of 180,000 psi and above shall be avoided. When the use of such cutting methods on hardened steels is unavoidable, detailed procedures and inspection methods shall be submitted to the procuring activity for review.

(f) Ground surfaces of parts heat treated to 180,000 psi and above shall be tested for the presence of grinding "burns" by etching in 3 to 5 percent Nital solution followed by a bake at 375° F for 3 hours.

"3.2.1.1 Heat treatment. - Heat treatment shall be accomplished in accordance with applicable specifications. All reasonable precautions shall be taken to minimize warpage during heat treatment. Steel parts that require straightening after hardening to 200,000 psi or below may be cold straightened, provided a stress relieving heat treatment is subsequently applied. Straightening of parts hardened to tensile strengths of 200,000 psi and above shall be accomplished at a temperature approximating, but not higher than, 50° F below tempering temperature.

"3.2.2 Forgings. - Aluminum and steel forgings shall be designed and produced in accordance with MIL-F-7190, MIL-A-22771, and QQ-A-367. Titanium forgings shall conform to MIL-T-9047. Forgings shall be produced from cast ingots or from fabricated stock conforming to the chemical composition requirements of the detail specification for the materials specified. Forging stock shall be worked prior to and during the forging operation to such extent to produce a wrought metallurgical structure with essentially uniform grain size throughout. The stock shall be of such size relative to the finished forging that the work accomplished in reducing to dimensions shall produce essentially uniform grain flow. The forger shall employ forging techniques that produce an internal grain flow pattern so that the direction of flow in highly stressed areas is essentially parallel to the principal stresses; and insure that the pattern is essentially free from re-entrant and sharply folded flow lines. In the design of forgings for parts to be subjected to simple load patterns, the forging parting lines shall be located in low-stressed areas. Forgings for highly stressed parts subjected to complex load pattern shall be so designed and forged as to eliminate forging flash. After the forging technique is established, sectioning and etching of the first raw forging shall be accomplished to determine grain flow structure. The sectioning procedure shall be repeated after any major change in the forging technique. All surfaces, except holes under 3/4 inch in diameter, of structural forgings forged from stress-corrosion susceptible alloys which, after final machining, exhibit transverse grain exposed to the surface shall be shot peened or placed in compression by other suitable means. The aircraft design shall include forging drawings for each forged shape, depicting the forging configuration, dimensions and tolerances; final machined configuration; direction of principal stresses; desired grain flow pattern, with location of die parting lines if forging flash formation is permissible; uniformity of forging work as reflected by permissible range of grain size variation; and location for sectioning of a sample forging representing the tentatively selected production forging technique, with location of samples for mechanical properties tests. Structural forging drawings shall be submitted to the procuring activity upon request.

"3.2.3 Aluminum. - The use of stress corrosion-resistant tempers or alloys is encouraged. If these tempers or alloys are not used, then shot peening or other means of placing surfaces in compression shall be used on areas susceptible to stress corrosion cracking. Deviations shall be approved by the procuring activity.

"3.2.3.1 Stress corrosion evaluation of aluminum forgings. - In addition to the above requirements, one aluminum forging from the first production lot of each configuration in the final-machined condition and without supplementary treatment shall demonstrate the capability of resistance to stress corrosion cracking for a period of 30 days when exposed to a solution of 3-1/2 percent NaCl conforming to the purity and pH requirements of Method 811 of Federal Test Method Standard No. 151, at room temperature, by alternate immersion.

The exposure cycle shall consist of 10 minutes immersion in the solution and 50 minutes out of the solution. Specimens shall be dried prior to each immersion. The alternate immersion test shall be continued for 90 days for information.

"3.2.4 Fatigue factors. - To prevent premature failures of parts, excluding fasteners, the contractor shall design, manufacture (including consideration of the damaging effect of decarburization and certain metallic coatings), assemble, and install all critical parts so that sustained/residual tensile stresses and stress concentrations are minimized. Whenever practicable, such practices as cold straightening, cold forming, and the assembly of mismatched surfaces that result in sustained/residual surface tensile stresses shall be avoided. In cases where such practices cannot be avoided, corrective practices, such as stress relief heat-treatment (except aluminum alloys), optimum grain-flow orientation, shot peening, or similar surface working to minimize premature fatigue failure shall be applied.

"3.2.5 Surface roughness height rating. - Components considered to be critical in fatigue shall have a surface roughness in the finished product not to exceed 63 rhr, as defined by B46.1, or must be shot peened, with a surface roughness prior to peening not to exceed 125 rhr. The surfaces of unmachined aluminum die forgings, with the exception of surfaces where flash has been removed, shall be visually and tactually equivalent to 150 rhr. Visual and tactual comparison shall be made using a standard machined aluminum plate calibrated to 150 rhr (by profilometer) and subsequently etched in a 10 percent (by weight) caustic bath at 180 ±10° F, rinsed with cold tap water, dipped in a nitric acid solution and rerinsed in hot water. (Caustic etching of the standard is used to simulate the conventional cleaning practices given to aluminum die forgings after forging and heat treatment in preparation for inspection and shipment.) Minor surface discontinuities, such as scratches, nicks, and grinding marks are permitted, provided that not more than 20 percent of the forged surface is affected. Such discontinuities shall be blended into adjacent surfaces so that no sharp edges or notches will remain, and notch roots are clearly visible.

"3.2.6 Stress corrosion factors. - To prevent premature failures due to stress corrosion cracking or hydrogen embrittlement, parts of high strength aluminum alloys, precipitation hardening steels, and alloy steels heat treated to tensile strengths above 220 ksi, shall be so designed, manufactured, assembled, and installed that sustained/residual tensile stresses and stress concentrations are minimized. Whenever practicable, the use of press or shrink fits, taper pins, clevis joints in which tightening, of the bolt imposes a bending load on the female lugs, and straightening or assembly operations that result in sustained/residual surface tensile stresses in these materials shall be avoided. In cases where such practices cannot be avoided, apply protective treatment such as stress relief heat treatments (except aluminum alloys), optimum grain-flow orientation, "wet installed" (with a protective material) inserts and pins, and shot peening or similar surface working to minimize the hazard of stress-corrosion cracking or hydrogen embrittlement damage.

"3.2.7 Protective treatment. - Materials used in the construction of shock struts that are subject to corrosion in salt air or other atmospheric conditions likely to occur during service usage, shall be protected against such corrosion in a manner that will in no way prevent compliance with the performance requirements. Metallic coatings and surface treatments shall be in accordance with MIL-S-5002, except that aluminum alloys shall be anodized in accordance with MIL-A-8625. Exterior surfaces of steel parts at 220 ksi and above which will operate at temperatures below 450° F shall be plated in accordance with MIL-C-8837 or AMS2419. Chrome plating of areas subjected to wear shall conform to QQ-C-320. Surfaces to be chrome plated shall be shot preened prior to plating. Other plating systems are available for parts operating at temperatures in excess of 450° F. Particular care shall be given to cleaning and surface preparation requirements of MIL-S-5002. General organic finishing shall be in accordance with MIL-F-7179. Specific finishing materials and processes shall be approved by the procuring activity. All aluminum components shall be anodized in accordance with MIL-A-8625. All steel components shall be cadmium plated in accordance with MIL-C-8837 or QQ-P-416. Cadmium plating shall not be used in applications where environmental temperatures exceed 450° F.

"3.2.8 Selection of specifications and standards. - Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143.

Page 12, paragraph 3.8, third line: Delete "MIL-STD-10" and substitute "B46.1."

Custodians:
Army - AV
Navy - AS
Air Force - 11

Preparing activity:
Air Force - 11

Project No. 1620-0045

Reviewer activities:
Army - AV
Navy - AS
Air Force - 11, 70

SPECIFICATION ANALYSIS SHEET

Form Approved Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity.

SPECIFICATION MIL-L-8552C (Amendment -2)
Landing Gear, Aircraft Shock Absorber (Air-Oil Type)

ORGANIZATION | CITY AND STATE

CONTRACT NO. | QUANTITY OF ITEMS PROCURED | DOLLAR AMOUNT $

MATERIAL PROCURED UNDER A
( ) Direct Government Contract ( ) Subcontract

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?
   A. GIVE PARAGRAPH NUMBER AND WORDING.

   B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID.

3. IS THE SPECIFICATION RESTRICTIVE?
   ( ) YES ( ) NO IF "YES", IN WHAT WAY?

4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity.)

SUBMITTED BY (Printed or typed name and activity) DATE

DD Form 1426