COMPONENT MAINTENANCE MANUAL

REPAIR OF HIGH-STRENGTH STEEL LANDING GEAR PARTS

PART NUMBER NONE

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COMPONENT MAINTENANCE MANUAL

Revision No. 9
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To: All holders of REPAIR OF HIGH-STRENGTH STEEL LANDING GEAR PARTS 32-00-05.

Attached is the current revision to this COMPONENT MAINTENANCE MANUAL

The COMPONENT MAINTENANCE MANUAL is furnished either as a printed manual, on microfilm, or digital products, or any combination of the three. This revision replaces all previous microfilm cartridges or digital products. All microfilm and digital products are reissued with all obsolete data deleted and all updated pages added.

For printed manuals, changes are indicated on the List of Effective Pages (LEP). The pages which are revised will be identified on the LEP by an R (Revised), A (Added), O (Overflow, i.e. changes to the document structure and/or page layout), or D (Deleted). Each page in the LEP is identified by Chapter-Section-Subject number, page number and page date.

Pages replaced or made obsolete by this revision should be removed and destroyed.

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Location of Change	Description of Change
32-00-05 REPAIR-GENERAL	Added clarifications and updated callouts.

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A = Added, R = Revised, D = Deleted, O = Overflow

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TEMPORARY REVISION AND SERVICE BULLETIN RECORD

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVE	DATE OF INCORPORATION INTO MANUAL

All revisions to this manual will be accompanied by transmittal sheet bearing the revision number. Enter the revision number in numerical order, together with the revision date, the date filed and the initials of the person filing.

Revision		Filed	
Number	Date	Date	Initials

Revision		Filed	
Number	Date	Date	Initials

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When the temporary revision is incorporated or cancelled, and the pages are removed, enter the date the pages are removed and the initials of the person who removed the temporary revision.

Temporary Revision		Inserted		Removed	
Number	Date	Date	Initials	Date	Initials

Temporary Revision		Inserted		Removed	
Date	Initials	Number	Date	Date	Initials

Temporary Revision		Inserted		Removed	
Number	Date	Date	Initials	Date	Initials

Temporary Revision		Inserted		Removed	
Date	Initials	Number	Date	Date	Initials

INTRODUCTION

1. General

A. The instructions in this manual supply the data necessary to do the maintenance functions together with the test, fault isolation, repair, and replacement of the defective parts.

B. This manual is divided into different parts:

(1) Title Page

(2) Transmittal Letter

(3) Highlights

(4) List of Effective Pages

(5) Table of Contents

(6) Temporary Revision & Service Bulletin Record

(7) Record of Revisions

(8) Record of Temporary Revisions

(9) Introduction

(10) Procedures & IPL Sections

C. Components that can be repaired have a different repair number for each specified repair. To find the repair number location of a component, look in the Repair-General procedure at the beginning of the REPAIR section. The Repair-General procedure also has an explanation of the True Position Dimension symbols used.

D. All dimensions, measures, quantities and weights included are in English units. When metric equivalents are given they will be in the parentheses that follow the English units.

E. The introduction to the Illustrated Parts List (IPL) shows how the IPL data is used.

F. Design changes, optional parts, configuration differences and Service Bulletin modifications may cause different part numbers. These part numbers are identified in the IPL with an alphabetical letter which is added to the end of the basic item number. This new item number is referred to as an alpha-variant. Throughout the manual, IPL basic item number references also apply to alpha-variants unless shown differently.

G. The tool reference numbers found in the individual procedures and in the Special Tools, Fixtures, and Equipment section are used to identify if a tool is a standard tool (STD-XXXX), a commercial tool (COM-XXXX), or a Special Tool (SPL-XXXX). This reference number is also used to distinguish between tools with similar names in the same procedure. These reference numbers are for use in the documentation only. They are not to be used for ordering tools.

DESCRIPTION AND OPERATION

1. Description And Operation

A. The procedures in this subject are for alloy steel landing gear parts heat-treated 180 ksi or above.

B. The data is general. It is not about specific parts or installations. Use this data as a guide to help you write minimum standards.

C. These procedures refer to the more general procedures in the Standard Overhaul Practices Manual (Chapter 20), document D6-51702. If the procedures in this subject do not agree with those in the Standard Overhaul Practices Manual, use the procedures in this subject.

D. These procedures start with parts which are removed from the airplane and disassembled for overhaul, but not yet put through shop processes such as stress relief, finish removal or material removal. Refer to the applicable overhaul instructions for details about specific repairs or refinish for a part. If the procedures in this subject do not agree with those in the overhaul instructions, use the procedures in the overhaul instructions.

E. These procedures are typical for all parts. The repair instructions for the specific part will tell you when to use these procedures.

(NOT APPLICABLE)

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REPAIR

1. **General**

   A. Use the flow charts (REPAIR-GENERAL, Figure 601, REPAIR-GENERAL, Figure 602) as a guide when you repair high-strength steel landing gear parts.

2. **Standard Practices**

   A. Refer to these standard practices, as applicable.

      (1) SOPM 20-10-02 Machining of Alloy Steel

      (2) SOPM 20-10-03 Shot Peening

      (3) SOPM 20-10-04 Grinding of Chrome Plated Parts

      (4) SOPM 20-20-01 Magnetic Particle Inspection

      (5) SOPM 20-20-02 Penetrant Methods of Inspection

      (6) SOPM 20-30-02 Stripping of Protective Finishes

      (7) SOPM 20-30-03 General Cleaning Procedures

      (8) SOPM 20-41-01 Decoding Table for Boeing Finish Codes

      (9) SOPM 20-42-01 Low Hydrogen Embrittlement Cadmium Plating

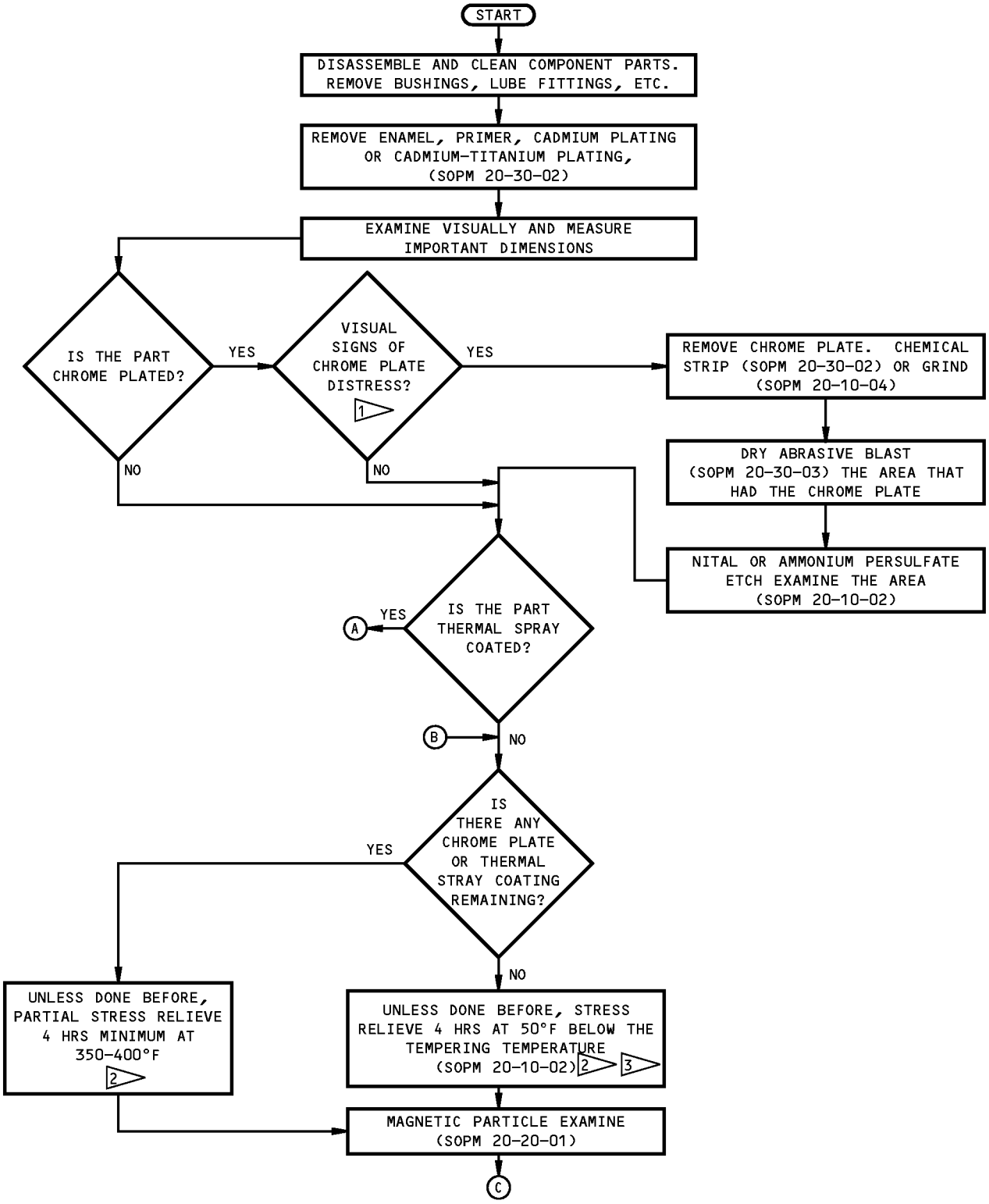
      (10) SOPM 20-42-02 Low Hydrogen Embrittlement Cadmium-Titanium Alloy Plating

      (11) SOPM 20-42-03 Hard Chrome Plating

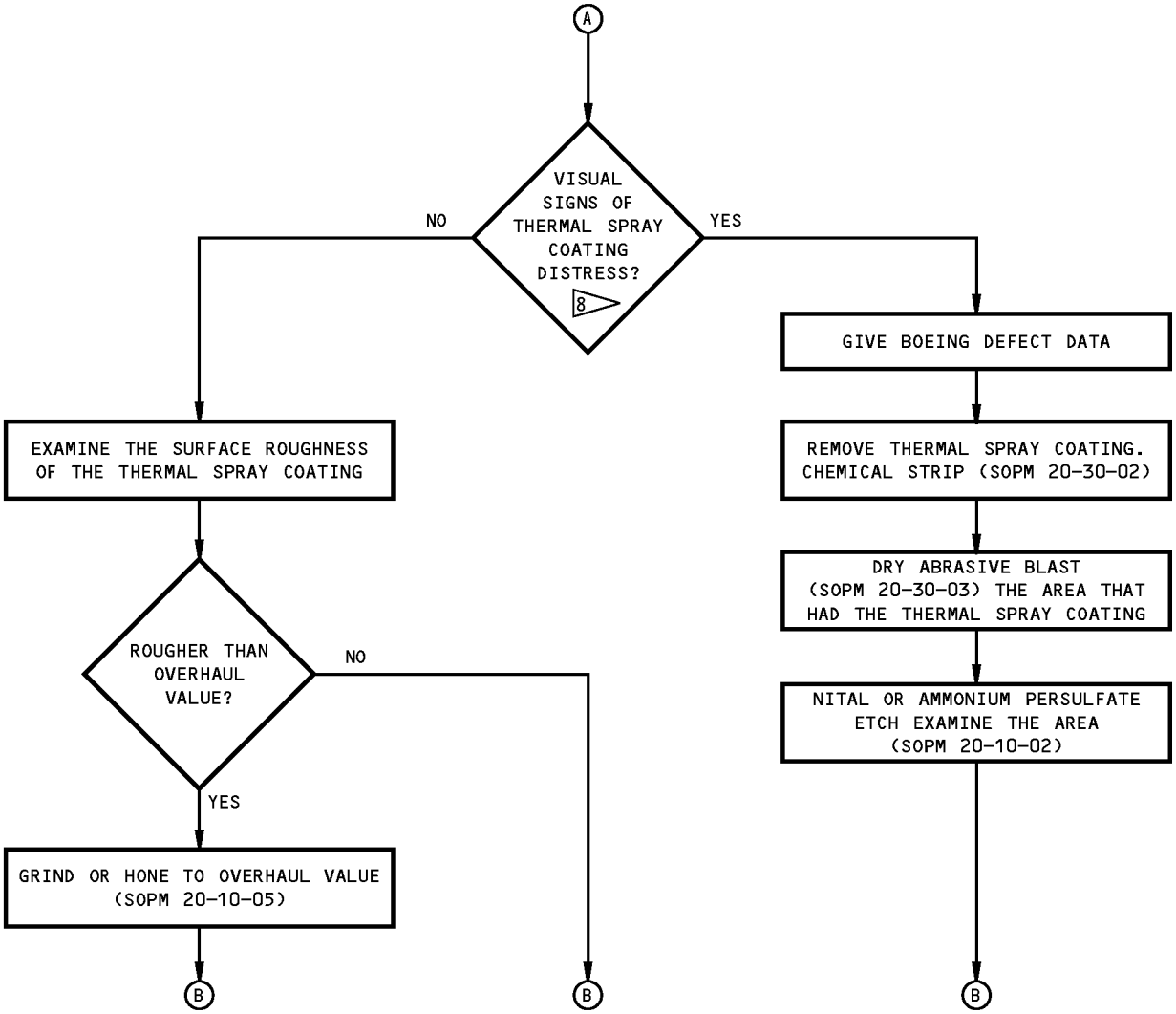
      (12) SOPM 20-42-05 Bright Cadmium Plating

      (13) SOPM 20-42-09 Electrodeposited Nickel Plating

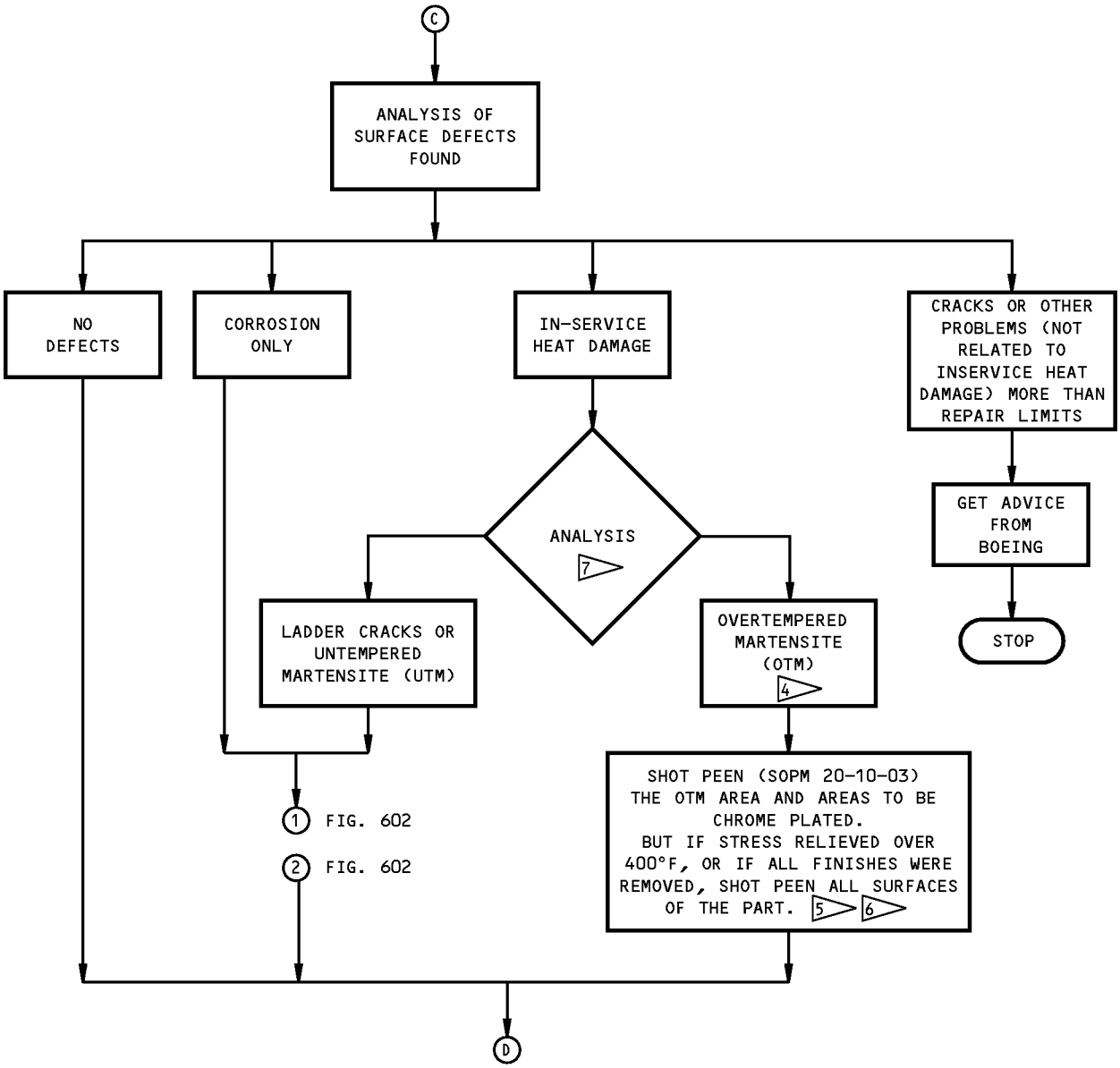
      (14) SOPM 20-50-03 Bearing and Bushing Replacement



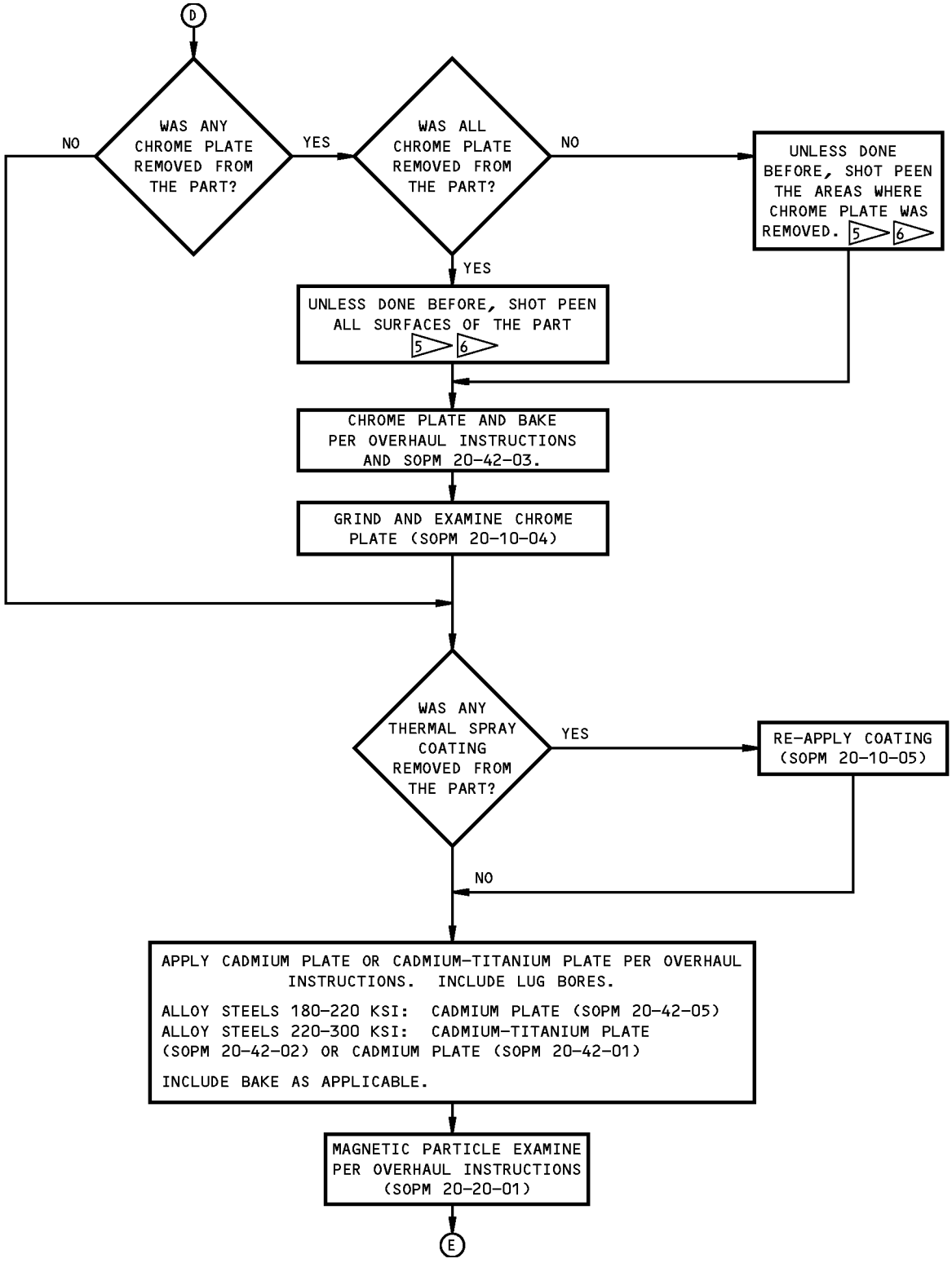
Basic Repair Procedure
Figure 601 (Sheet 1 of 6)



Basic Repair Procedure
Figure 601 (Sheet 2 of 6)



Basic Repair Procedure
Figure 601 (Sheet 3 of 6)



Basic Repair Procedure
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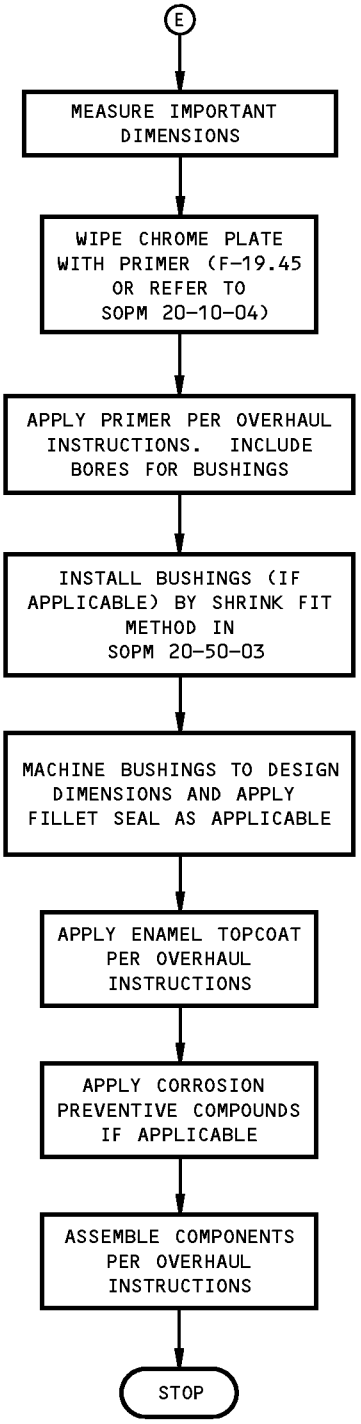
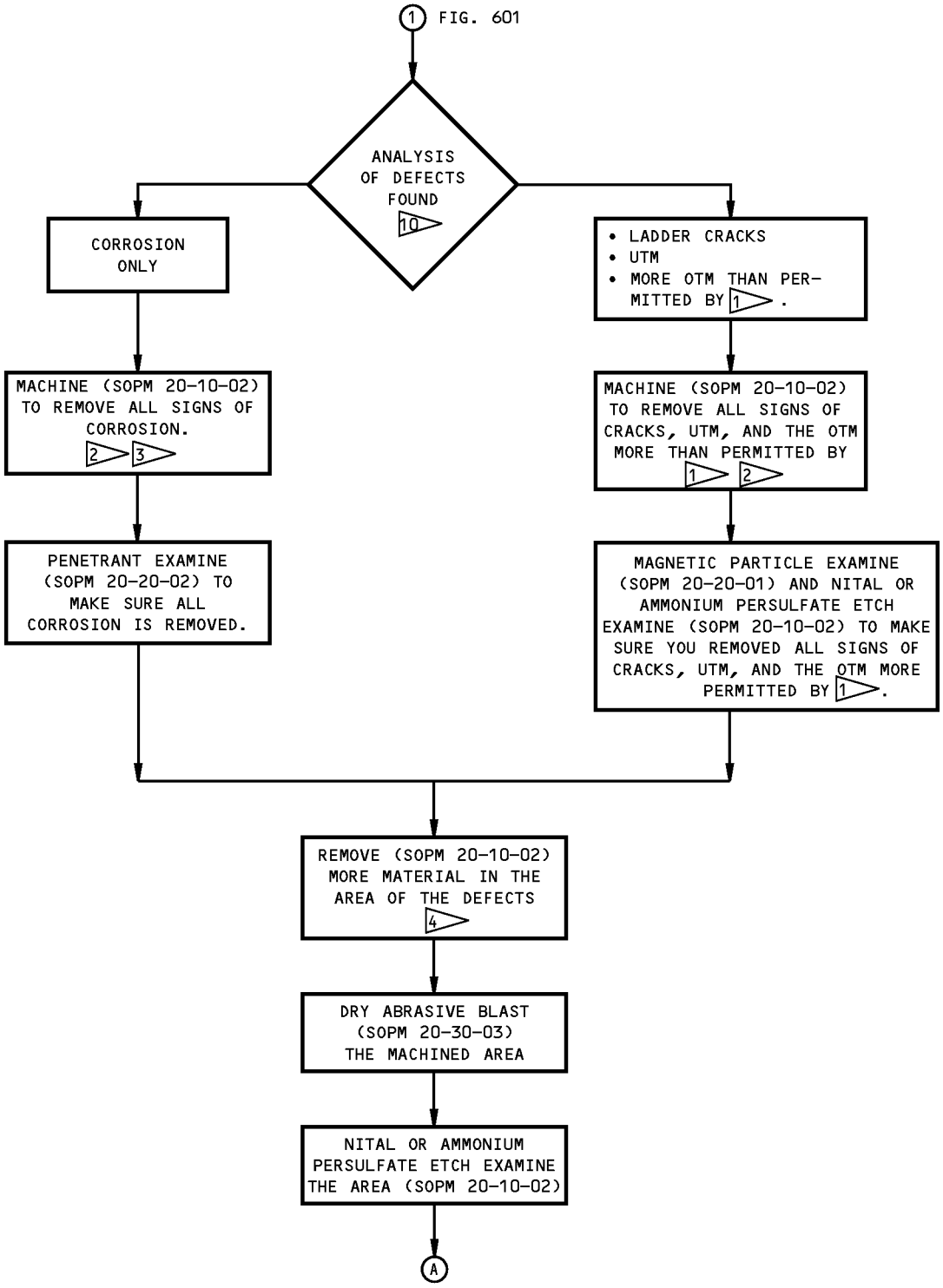


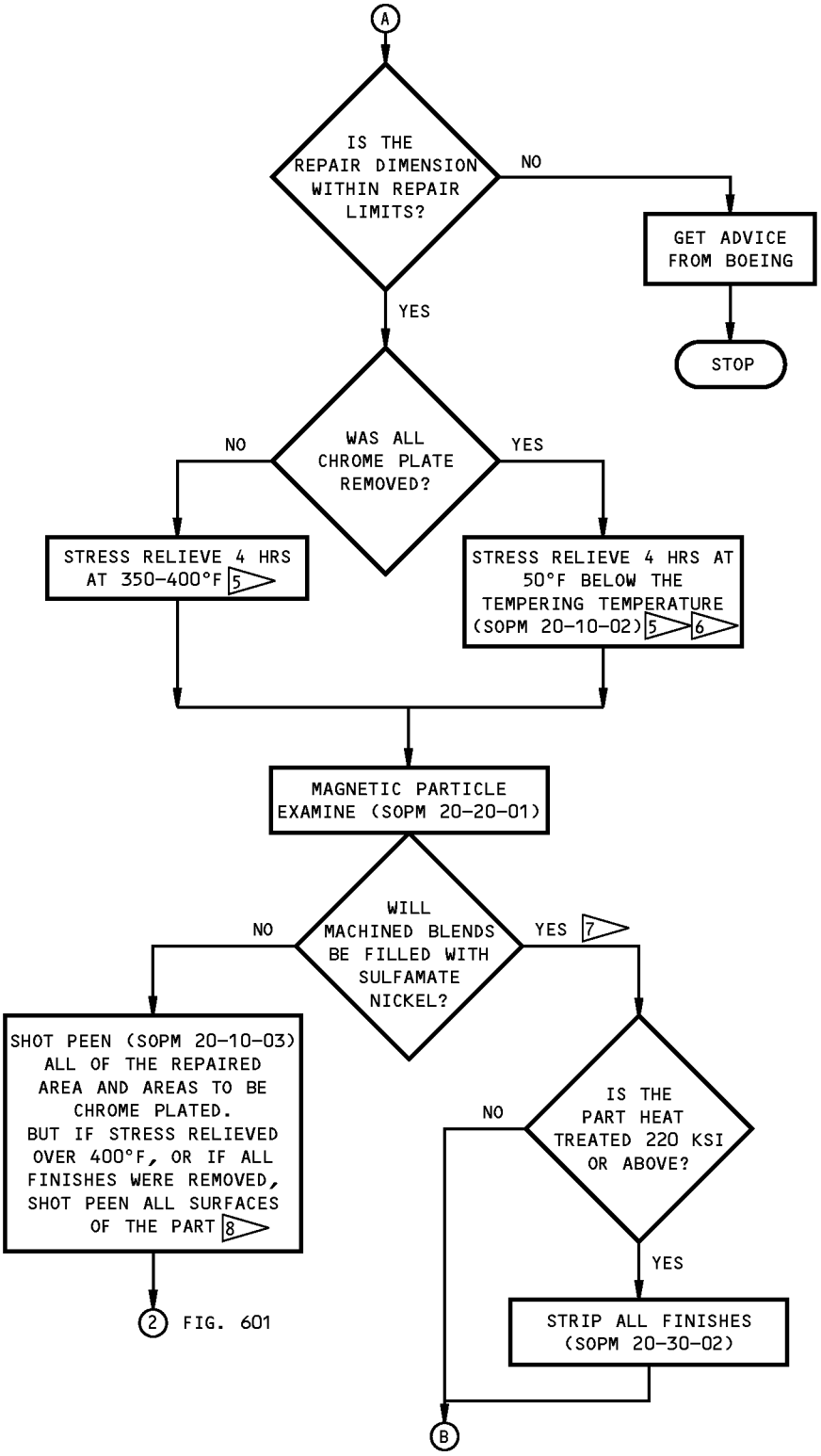
Basic Repair Procedure
Figure 601 (Sheet 5 of 6)

1. SIGNS OF CHROME PLATE DISTRESS INCLUDE LADDER CRACKS, MATERIAL OR BRONZE TRANSFER, DARKENED STREAKS, PLATING WHICH IS SMEARED, CHIPPED, CRACKED, FLAKED, A DIFFERENT COLOR, OR GONE. VISUALLY EXAMINE THE PLATED SURFACES WITH LIGHT AT AN ANGLE, BUT DO NOT USE MAGNIFICATION. LOOK AT THE SURFACES FROM DIFFERENT ANGLES. YOU CAN ALSO FIND CRACKS IN THE PLATING WITH THE SHARP POINT OF A DENTAL EXPLORER.
2. SET THE FURNACE TEMPERATURE TO STAY IN THE SPECIFIED RANGE. START THE TIMER WHEN ALL THE THERMOCOUPLES ARE BACK INTO THE SPECIFIED TEMPERATURE RANGE AFTER YOU PUT THE PARTS INTO THE FURNACE.
3. AS AN ALTERNATIVE, PARTIAL STRESS RELIEVE 4 HRS AT 350-400°F. 2
4. FOR STRESS ANALYSIS ONLY, MAKE THE ASSUMPTION THAT THE ETCHED AREA THAT INDICATES OTM IS 0.010 INCH DEEP AND DOES NOT SUPPORT LOADS. THIS ASSUMPTION WILL HELP YOU FIND OUT IF THE DEFECTS ARE MORE THAN THE REPAIR LIMITS IN THE OVERHAUL INSTRUCTIONS. (IF THEY ARE, BOEING APPROVAL OF THE REPAIR IS NECESSARY.) OVERTEMPERED MATERIAL CAN STAY ON FLAT OR LIGHTLY ROUNDED SURFACES, SUCH AS THE ID OR OD OF LANDING GEAR CYLINDERS. OVERTEMPERED MATERIAL MUST BE REMOVED PER FIG. 602 IF THE OTM EXTENDS INTO AN EDGE, CHAMFER, CORNER, RADIUS, FILLET, OR HOLE, OR IF IT IS MADE DURING MACHINING, GRINDING, OR OTHER OVERHAUL OPERATIONS.
5. IF THE SHOT HAS CADMIUM CONTAMINATION, CLEAN THE SHOT PEENED SURFACES AFTER THE PEEN AND BEFORE YOU PLATE. USE ABRASIVE GRIT BLAST OR AMMONIUM NITRATE.
6. FOR AREAS NOT TO BE SHOT PEENED, REFER TO APPLICABLE OVERHAUL INSTRUCTIONS.
7. REFER TO SOPM 20-10-02 FOR DESCRIPTIONS OF OVERTEMPERED AND UNTEMPERED MARTENSITE.
8. VISUALLY EXAMINE THE THERMAL STRAY COATING WITH UNAIDED EYES FOR LADDER CRACKS, SPALLING, PULL-OUTS, CRACKS, CHIPS, FLAKES, LIFTING, COLOR CHANGES BECAUSE OF HEAT, OR OTHER DEFECTS. IF YOU THINK THERE ARE DEFECTS, EXAMINE WITH A MINIMUM OF 10X MAGNIFICATION. YOU CAN USE A DENTAL PICK TO HELP FIND DEFECTS. YOU CAN ALSO USE LOW SENSITIVITY FLUORESCENT PENETRANT EXAMINATION (SOPM 20-20-02) TO EXAMINE LARGE PARTS FOR AREAS TO BE VISUALLY EXAMINED.

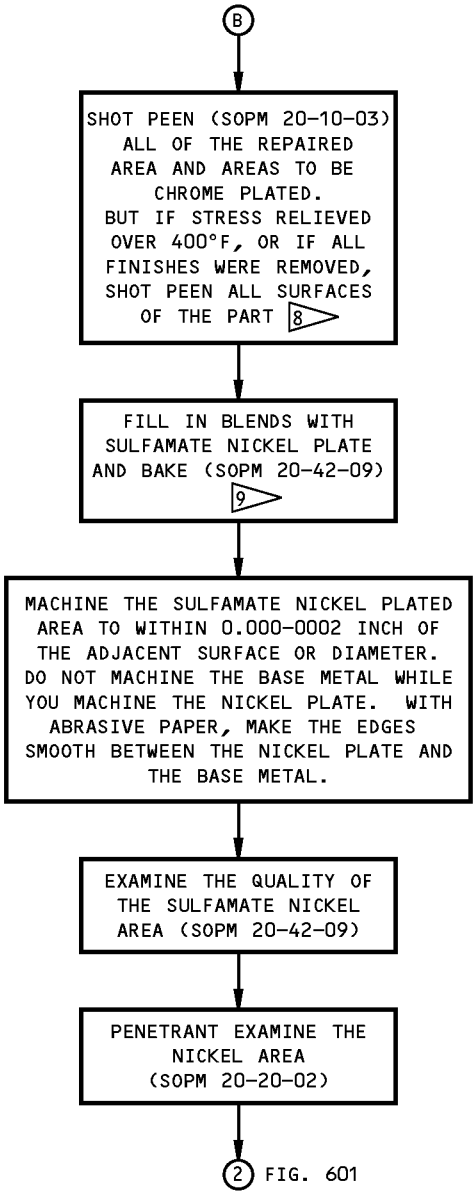
Basic Repair Procedure
Figure 601 (Sheet 6 of 6)



Removal of Corrosion or In-Service Heat Damage
Figure 602 (Sheet 1 of 4)



Removal of Corrosion or In-Service Heat Damage
Figure 602 (Sheet 2 of 4)



Removal of Corrosion or In-Service Heat Damage
Figure 602 (Sheet 3 of 4)

1. FOR STRESS ANALYSIS ONLY, MAKE THE ASSUMPTION THAT THE ETCHED AREA THAT INDICATES OTM IS 0.010 INCH DEEP AND DOES NOT SUPPORT LOADS. THIS ASSUMPTION WILL HELP YOU FIND OUT IF THE DEFECTS ARE MORE THAN THE REPAIR LIMITS IN THE OVERHAUL INSTRUCTIONS. (IF THEY ARE, BOEING APPROVAL OF THE REPAIR IS NECESSARY). OVERTEMPERED MATERIAL CAN STAY ON FLAT OR LIGHTLY ROUNDED SURFACES, SUCH AS THE ID OR OD OF LANDING GEAR CYLINDERS. OVERTEMPERED MATERIAL MUST BE REMOVED IF THE OTM EXTENDS INTO AN EDGE, CHAMFER, CORNER, RADIUS, FILLET OR HOLE, OR IF IT WAS MADE DURING MANUFACTURE.
2. FOR APPROVED REPAIRS AND LIMITS, REFER TO APPLICABLE OVERHAUL INSTRUCTIONS. MATERIAL REMOVAL MUST INCLUDE ALLOWANCE FOR INSURANCE CUTS PER 4.
3. REMOVAL OF LIGHT CORROSION WITH HAND HELD TOOLS WITHOUT POWER (ABRASIVE CLOTH, FILES, ETC.) IS ACCEPTABLE IF ALL ACTIVE CORROSION IS REMOVED AND THE TASK IS COMPLETED WITH THE CORRECT SURFACE FINISH.
4. WE HIGHLY RECOMMEND THAT YOU REMOVE 0.003-0.005 INCH MORE MATERIAL FROM A SURFACE WHERE KNOWN HEAT DAMAGE, CRACKS, OR CORROSION WAS REMOVED. BUT BEFORE YOU DO THIS, MAKE SURE THE REPAIR WILL NOT BE MORE THAN THE LIMIT IN THE OVERHAUL INSTRUCTIONS. (IF THEY WILL BE, BOEING APPROVAL WILL BE NECESSARY BEFORE YOU CAN REPAIR THE PART).
5. SET THE FURNACE TEMPERATURE TO STAY IN THE SPECIFIED RANGE. START THE TIMER WHEN ALL THE THERMO-COUPLES ARE BACK INTO THE SPECIFIED TEMPERATURE RANGE AFTER YOU PUT THE PARTS INTO THE FURNACE.
6. AS AN ALTERNATIVE, PARTIAL STRESS RELIEVE 4 HRS AT 350-400°F. 5
7. SULFAMATE NICKEL PLATE (SOPM 20-42-09) CAN BE USED TO BUILD UP SURFACES WHERE MATERIAL WAS LOCALLY REMOVED MORE THAN THE DESIGN DIMENSIONS. THE THICKNESS OF THE NICKEL AREA IS LIMITED ONLY BY THE AMOUNT OF BASE METAL THAT CAN BE REMOVED AND KEEP THE PART STRUCTURALLY ACCEPTABLE. IF THIS NICKEL REPAIR IS NOT IN THE APPLICABLE OVERHAUL INSTRUCTIONS, GET APPROVAL FROM BOEING STRUCTURES ENGINEERING. IMPORTANT FACTORS ARE LOCATION, EFFECT ON FATIGUE, BEARING STRESSES IN THE REPAIRED AREA, AND SUFFICIENT HYDROGEN BAKE-OUT PATH.
8. FOR AREAS NOT TO BE SHOT PEENED, REFER TO APPLICABLE OVERHAUL INSTRUCTIONS.
9. BLENDS CAN BE FILLED WITH CHROME PLATE IF THE SURFACE WAS CHROME PLATED AND THE TOTAL DEPTH OF PLATING REQUIRED TO GET BACK TO DESIGN DIMENSION IS NOT MORE THAN 0.015 INCH.
10. REFER TO SOPM 20-10-02 FOR DESCRIPTION OF OVERTEMPERED AND UNTEMPERED MARTENSITE.

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Removal of Corrosion or In-Service Heat Damage
Figure 602 (Sheet 4 of 4)

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FITS AND CLEARANCES

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ILLUSTRATED PARTS LIST

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