

EO 15-35-2

ROYAL CANADIAN AIR FORCE



**DESCRIPTION AND MAINTENANCE
INSTRUCTIONS
ALL AIRCRAFT WHEELS**

(This EO replaces EO 15-35-2 dated 8 Feb 57)

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF

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LIST OF RCAF REVISIONS

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INTRODUCTION

To prevent corrosion, fatigue cracks, reduce overhaul costs and eliminate resulting accidents and incidents, Engineering Officers are to insure that the requirements of this Engineering Order are brought to the attention of aircraft Maintenance personnel.

Emphasis must be placed on the importance of proper wheel maintenance procedures. A casual and haphazard approach to wheel maintenance must be discouraged.

Generally wheel failures from fatigue are progressive in nature and if proper cleaning and inspection procedures are carried out accidents and incidents involving wheel failures could be prevented.

NOTE

Investigation has proven that wheel failures have resulted from incidental and insignificant surface dents.

To help eliminate corrosion and failure all aircraft wheels will be cleaned inspected, repaired, and maintained at times of tire change by all levels of maintenance in accordance with the instructions contained herein.

These instructions are of a general nature for all aircraft wheels. Reference will be made to the applicable wheel handbook for specific instructions.

PART 1**WHEEL MAINTENANCE INSTRUCTIONS****GENERAL**

1 All aircraft wheels are manufactured from either magnesium or aluminum alloy. These materials are susceptible to corrosion, scoring and galling, careless and rough handling should be avoided. During dismantling operations where the wheel casting is likely to contact the bench or floor, a rubber or felt mat is to be used, this will prevent damage to the anti-corrosive treatment on the casting.

CLEANING

2 Remove the tire, tube and bearing cones from the wheel in accordance with applicable directives (Tires EO 110-5-2). Thoroughly clean the wheel with a mixture of emulsion cleaner RCAF Ref. 33G/690 and cleaners fluid Spec. 3-GP-8A, RCAF Ref. 33C/182. EO 50-10-2A outlines the proper mixture and cleaning procedures. Clean, inspect and lubricate bearings and seals in accordance with instructions contained in Part 2 of this EO.

NOTE

The brake drum or drive keys need not be removed from the wheels to accomplish the instructions included in this EO.

INSPECTION DEMOUNTABLE**FLANGE-TYPE WHEEL**

3 The inspection will be carried out in the following manner:-

(a) Cracks.

(1) Thoroughly inspect wheel visually for cracks. If any cracks are found the wheel is to be returned for overhaul. The use of a magnifying glass and Dye Penetrant using kit 33C/749

in accordance with EO 105-1-2B is to be used in suspected areas. Areas must be stripped of lacquer prior to Penetrant application.

(2) Cracks usually are found in and around the flange lock ring groove, in the drive key area, in the spoke and webbing area and in the demountable flange.

(3) Cracked flanges are caused by improper procedures when the flanges are removed or installed. A controlled force should be used for depressing the flange when removing the retainer ring. The force should be applied in such a manner that the flange will not strike the valve stem. If the flange strikes the valve stem, either or both may be damaged. A damaged flange may result in a crack and subsequent failure. The flange should be moved down only enough to allow removal of the retainer ring.

(b) Corrosion.

(1) Inspect the wheel thoroughly for indications of active corrosion.

(2) Corrosion will usually be found in the demountable flange lock ring groove in the drive key area, in the brake drum area, in the bearing cavity and in the valve stem recess.

(3) Active corrosion in these areas is considered to be critical. If active corrosion is found that exceeds a pattern of five pits in any square inch or forms a line three inches long, the wheel should be surface treated and returned for overhaul.

NOTE

No definite criterion exists for stating that a wheel is unserviceable for corrosion patterns above. These patterns

may be exceeded on a serviceable wheel, provided that all of the corrosion has been deactivated and the surface has been refinished.

SPLIT-TYPE WHEEL INSPECTION

4 The inspection will be carried out in the following manner:

(a) Cracks.

(1) Inspect the wheel in the same manner that is outlined in para. 3(a)(1).

(2) Cracks may be found in the following areas; tie bolt, boss drive key, webbing and spoke.

(b) Corrosion.

(1) Inspect for active corrosion indications.

(2) Corrosion is usually encountered in the tie bolt boss area, in the brake drum area, and in the bearing cavity area.

(3) The criterion for removal of wheels from service for corrosion is the same as that described in para. 3(b).

DAMAGE

5 Inspect wheels for dents nicks burrs gouges, and deep scratches. Wheels with minor defects should be reworked to relieve all sharp corners or indentations that could result in stress concentrations.

6 Wheels with demountable flanges with dents, nicks, burrs or deep scratches will be removed from service and returned for overhaul. Rework of demountable flanges is not authorized. Damaged flanges can cause serious accidents.

SURFACE TREATMENT

7 All wheels to be returned to service or

overhaul will be corrosion treated in accordance with EO 05-1-2AH. Chrome pickle treatment will be applied to all areas where the surface treatment has been removed by wear or rework. This treatment is used for brush application to limited areas. Safety precautions outlined in EO 00-80-4/22 are to be observed.

NOTE

When wheels are to be returned for overhauled bearings and cups shall be coated liberally with grease 34A/122, 3-GP-690, AM2 and prepared for shipment in accordance with EO 75-10-17.

REFINISHING

8 The most important single item for corrosion prevention in wheels is the paint if applied over a clean treated surface. Therefore clean all surfaces to be painted with extreme care to insure a good bond between the paint and the wheel. All areas where the paint has been removed, will be refinished in accordance with the following instructions:

(a) Clean all dirt and grease from the surface to be painted using a suitable solvent.

(b) Apply two coats of zinc chromate primer RCAF Ref. 33A/462.

NOTE

The color provides an excellent means of gaging the thickness of the coating. A medium coating with a distinctly greenish cast should be applied. A full yellow color indicates that the coating is too heavy.

(c) Apply two coats of aluminized lacquer RCAF Ref. 33A/424, 425.

(d) Paint two-piece demountable flange-type wheels in the same manner, except that one coat of lacquer will be applied to the inside diameter of the flange and to that portion of the wheel covered by the flange.

CAUTION

Do not apply aluminum lacquer to the inside diameter of a one piece demountable flange or to the area of the wheel that will be covered by the flange. Protect bearing cups from paint.

INSTALLATION AND SERVICE**LIFE**

9 All new or overhauled wheels are to be date stamped prior to installation. Using metal stamps, stamp date code adjacent to last overhaul or manufacture date. The date code will consist of three numbers. The first digit will represent the quarter part of the year, and the last two numbers will indicate the year, as shown in the following examples.

- (a) 157 to represent a wheel fitted to an aircraft the first quarter of 1957.
- (b) 459 to represent a wheel fitted to an aircraft the last quarter of 1959.

REMOVAL FROM SERVICE

10 In addition to the reasons previously

outlined, wheels shall be removed from service and returned for overhaul when:

- (a) Expiration of "in service life" as indicated in the Appendix "A" of the relevant aircraft maintenance schedule.
- (b) After a heavy landing where it is adjudged the wheel has been subjected to abnormal stress, or has sustained damage.
- (c) After a blowout or flat tire. This may be waived at the discretion of the Engineering Officer if the wheel has not rolled under load in a deflated state.
- (d) After a brake fire where damage is apparent, suspected or if an extinguishing agent other than recommended in EO 00-80-4/32 has been used.
- (e) Wheel castings that wobble when rolled across a smooth surface will be returned for overhaul.
- (f) Whenever one-half of a wheel assembly is rejected both halves shall be rejected and returned for overhaul. In no instance will it be permissible to assemble the remaining wheel half with another wheel-half unless, specifically authorized in the applicable wheel Engineering Order.

PART 2

LUBRICATION OF AIRCRAFT WHEEL ANTI-FRICTION BEARINGS AND BEARING GREASE SEALS

GENERAL

1 To provide better lubrication and prevent corrosion of all aircraft anti-friction bearing installed in all aircraft main and auxiliary landing wheels, grease, 3-GP-690, AM2, RCAF Ref. 34A/122, will be used for lubrication purposes. Lubrication of wheel bearings as outlined in para. 2 will be accomplished at periodic inspection periods as established in the applicable Aircraft Inspection Schedules. Also after every aircraft washing, where ingress of cleaning fluid is apparent or suspected. When a wheel or tire is changed,

CLEANING, INSPECTION, ADJUSTMENT AND LUBRICATION OF AIRCRAFT WHEEL ANTI-FRICTION BEARINGS

2 Proceed as follows:

- (a) Remove the aircraft wheels following the instructions contained in the applicable aircraft Handbook and clean the bearings with cleaner fluid CGSB 3-GP-8A RCAF Ref. 33C/182. When the bearings have been cleaned of all contamination, dry thoroughly using moisture-free air or lint free cloth.
- (b) Inspect for the following conditions:
 - (1) Brinelling of the active bearing surfaces of cup and cone. (See EO 75-10-2B).
 - (2) Bent, cracked, or broken cages (See EO 75-10-2B).

(3) Corrosive pitting of the bearing surfaces. Pits on the active parts of rollers or races are not cause for rejection unless pits exceed 0.015 inches or there is a cluster of more than three pits in an area, of 1/4 inch diameter. Pits sufficient to cause loss of more than 20% of the area of contact on nonactive surfaces are cause of rejection.

(4) Heavy, blue discoloration from excessive heat. Similar conditions can be caused by grease deterioration. The initial condition of brown staining does not affect serviceability.

(5) Flaked, smeared, cracked or broken active bearing surfaces. (See EO 75-10-2B).

(6) Galled bearing bores or loose bearing cups which affect proper seating on axle or in wheel castings. (Determine by deminsional or visual checks).

DEFECTIVE WHEEL BEARINGS

3 During inspection, all bearings noted possessing any of the defects outlined above shall be replaced and unserviceable bearings discarded.

INSPECTION AND LUBRICATION OF BEARING GREASE SEALS

4 The following instructions will prevent water, dust, sand and other foreign matter from entering the wheel bearings during the established service period, and provide a more satisfactory grease seal for wheel bearing installation on aircraft.

(a) Clean felt seals with a dry cleaning solvent, RCAF Ref. 33C/182.

(b) Dry felt seals thoroughly, using moisture-free air or absorbent solvent with a lint-free cloth; then let dry in free air.

(c) Oil seals with oil 3-GP-51, RCAF Ref. 34A/21 or equivalent before installation on aircraft.

(d) Remove felt seals from service if after normal cleaning:

(1) Seals are still embedded with foreign matter.

(2) The felt material is not pliable and,

(3) The material is broken and does not retain the necessary shape to afford proper sealing.

CAUTION

The landing gear axle collars should be removed from service in the event that indication of excessive wear is present in the seal contact area.

5 Repack the bearing cones using grease CGSB 3-GP-690, AM2, RCAF Ref. 34A/122. The correct quantity of grease is that which is that which can be packed into the bearing recesses of the bearing cone and roller assembly by hand or with bearing packer RCAF Ref. IT/1426. A light coat of grease should be applied on the bearing cup surfaces but no grease should be applied in the center of the hole between the bearings or in the outer dust cap. Lubrication should be accomplished immediately after inspection to prevent corrosion.

CAUTION

Most wheel bearings packed for storage as spares are preserved with an anti-corrosion compound. In no case will wheels be installed until it is certain that the bearings are properly lubricated with grease, 3-GP-690, AM2, Ref. 34A/122.

6 Re-install wheels and tighten the axle nut until all side play is eliminated and the bearings are properly seated. Make the necessary adjustments to eliminate any brake drag. Back off the axle nut slightly then rotate the wheel by hand and retighten the axle nut until a slight bearing drag is felt at the wheel. If cotter key lines up at this position, insert cotter key without backing off adjusting nut. If necessary move adjusting nut in order to insert cotter key, back off adjusting nut to the closest point to line it up. Insert cotter key and safety.

PREVENTATIVE MAINTENANCE

7 Preventative maintenance shall be accomplished as follows:

(a) In washing down aircraft either with water, steam or solvent, with or without one or more of the various detergent compounds, exercise extreme care to prevent the blast of the cleaning stream from entering or contaminating the anti-friction bearing. Never direct the cleaning blast directly against any exposed bearing. The force of this cleaning stream blast plus its solvent may contaminate or remove grease from the bearing. Such action also results in washing out lubricant and subsequent deterioration of the bearing due to oxidation taking place on the rolling elements and raceways.

PART 3

WHEEL BALANCING

1 Wheel assemblies are statically balanced at the time of manufacture to conform to the limits established in Specification MIL-W-5013. This is accomplished by balancing individual wheel halves and wheel sub-assemblies using specific weights as necessary to bring the unit within the established tolerances. THESE WEIGHTS SHOULD NOT BE REMOVED BY USING ACTIVITIES OR DEPOT FACILITIES WHILE THE WHEEL ASSEMBLY IS UNDERGOING TIRE CHANGE OR REPAIR.

2 Wheel assemblies will be checked for static balance by fourth line maintenance whenever an assembly is reconditioned. Divided half or split-type wheels will be checked individually to prevent possible unbalanced condition when the wheel assembly is re-assembled. The following instructions will be used as a guide.

(a) Place the unit to be balanced and a suit-

able adapter on a Bulls-Eye-Bubble-Type balancing fixture and check static balance. If assigned weights have not been removed or replaced, the item being checked will usually be within the limits shown in Figure 3-1.

(b) If the unit being checked does not balance within the tolerance given, determine the point of maximum unbalance and attach sufficient weights to rebalance the unit in accordance with existing instructions.

NOTE

Wheels will not be balanced with tire and tube installed.

**INSTALLING WEIGHTS ON
SUB-ASSEMBLIES WITH
INTERNAL RIBS
(GOODYEAR WHEELS)**

3 Install weights on sub-assemblies as follows:

(a) Wheels with internal ribs are of two types; one-piece wheels and box-type split wheels. The box-type is that type in which each half is boxed-in by inboard and outboard spoke structure and which contains a series of transverse or axial ribs as well as radial ribs. Both of these type wheels will have the unbalanced condition corrected using clamp weights as illustrated.

(b) Split Wheel sub-assemblies shall be balanced individually and weight "A" will be used on the ribs which will seat on the bottom of the weight. Weights "B" and "C" type shall be used on heavy ribs or "beaded" ribs.

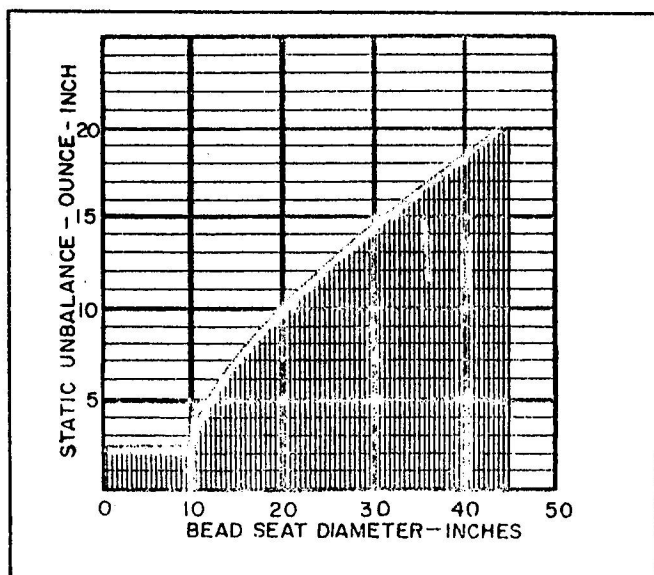


Figure 3-1 Balance Chart

(c) All clamp weights are to be attached to the transverse or axial ribs as close to the center line as possible. Where ribs are too shallow at the center line to permit proper clamping, the weights may be moved toward either face of the wheel. Weights should never be attached to radial or sloping ribs unless it is impossible or impractical to attach them to a transverse or axial rib.

(d) In one-piece wheels, where weights must be located farther from the centerline than half the distance from the centerline to either face of the wheel, the weight required, if two ounces or more, shall be divided so as to place approximately one-half the total weight on each side as nearly equidistant as possible from the wheel centerline.

(e) After the weight is secured and locked to prevent loss, apply one coat of aluminum lacquer, Specification MIL-L-7178.

INSTALLING WEIGHTS ON WHEELS WITH EXTERNAL RIBS (GOODYEAR WHEELS)

4 Install weights on wheels as follows:

(a) This type of wheel is balanced by using a screw, weights, and a nut, usually placed in the location of maximum unbalance.

(b) Balancing this type of wheel is accomplished by adding weights, Type "D", see Figure 3-2 to the existing weights.

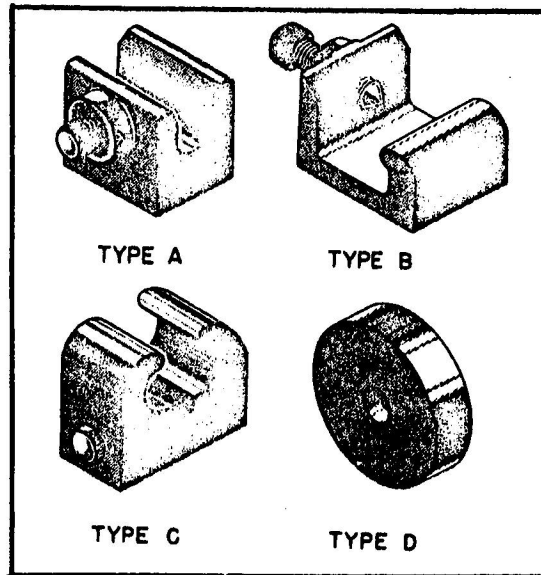


Figure 3-2 Balance Weights

(c) See applicable Engineering order for proper weight, part number, and individual weight.

(d) Before the cylindrical weight "D" is attached, a light coat of compound sealing, RCAF Ref. 33G/19 or equivalent, should be applied to the wheel.

(e) After the weights are securely fastened, a coat of compound sealing, RCAF Ref. 33G/19 or equivalent, should be applied over the head of the screw and painted in accordance with existing instructions.