BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 12.03

PRODUCTION PROCESS STANDARD

Staking of Bearings

Issue 10
- This standard supersedes PPS 12.03, Issue 9.
- Vertical lines in the left hand margin indicate changes over the previous issue.
- Direct PPS related questions to PPS.Group@aero.bombardier.com or (416) 375-4365.
- This PPS is effective as of the distribution date.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for staking of bearings in aircraft parts and assemblies.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction and the procedure specified must be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives.

1.1.2 Refer to PPS 13.26 for the subcontractor provisions applicable to this PPS.

1.1.3 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. **do not** supersede the procedure or requirements specified in this PPS. Similarly, the procedure and requirements specified in this PPS are not applicable when use of a BAPS, MPS, LES or P. Spec. is specified.

2 Hazardous Materials

2.1 Before receipt at Bombardier Toronto (de Havilland), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto (de Havilland) Environment, Health and Safety Department. Refer to the manufacturer's MSDS for specific safety data on any of the materials specified in this PPS. If the MSDS is not available, contact the Bombardier Toronto (de Havilland) Environment, Health and Safety Department.

3 References

3.1 PPS 13.26 - General Subcontractor Provisions.

3.2 PPS 19.02 - Use of Anaerobic Sealant/Adhesive.

4 Materials and Equipment

4.1 Materials

4.1.1 No materials specified.

4.2 Equipment

4.3 Ball staking tools (e.g., TS.323.31.11).

4.4 Semi-ball staking tools (e.g., TS.323.32.11).

4.5 Staking tool adapters (e.g., TS.323.04.21 MK 500 and MK 688).

4.6 Compression riveter (e.g., CP 450 EA).

5 Procedure

5.1 General

5.1.1 Except as noted below, for bearings to be installed either with an interference (0.0005" max.) or clearance fit (0.0015" max.), install the bearing using anaerobic sealant/adhesive according to PPS 19.02 instead of staking the bearing. In the following instances do not

- Do not use anaerobic sealant/adhesive to retain bearings in potential fire zones, and any other areas where the temperature may exceed 300°F.
- Do not be use anaerobic sealant/adhesive to retain bearing assemblies which are to be lubricated through lubrication fittings in service.
- Contact Liaison Engineering whenever there is doubt as to the applicability of retaining bearings using anaerobic sealant/adhesive in place of staking.

5.1.2 Staking of bearings according to this PPS consists of pressing ball or semi-ball shaped indentors into the surface of the part, around the perimeter of the hole or recess in which the bearing is housed, so as to displace metal inwardly to lock the bearing in place.

5.1.3 Keep bearings in their protective wrapping until immediately before installation.

5.2 Staking Tools

5.2.1 Staking tools consist of a staking punch, support anvil and pilot mandrels for each bearing size to be staked. TS tool sizes are designated by Mark numbers indicating applicable bearing O.D. in 32nds of an inch (e.g., a MK 8 has a 1/4" O.D.) and a dash number indicating pilot diameter in 16ths of an inch as a suffix to the basic TS number (e.g., a -3 has a 3/16" pilot).

5.2.2 Use semi-ball staking tools (e.g., TS.323.32.11) in conjunction with the riveter (e.g., CP 450 EA) for staking bearing in steel housings and for non-ferrous housings having a wall thickness of 0.120" - 0.180".

5.2.3 Use ball staking tools (e.g., TS.323.31.11) in conjunction with the riveter (e.g., CP 450 EA) for staking bearings in non-ferrous metal housings which have a wall thickness of at least 0.180".

5.2.4 Staking tools (e.g.,TS.323.32.11 and TS.323.31.11) are fitted to the riveter (e.g., CP450EA) by means of staking tool adapters (e.g., TS.323.04.21 MK500 or MK688). TS adapter Mark numbers indicate staking punch and anvil locating boss diameters.

5.3 Assembly of Bearings to Housings

5.3.1 Assemble bearings to the part housings as follows:

Step 1. Ensure that the bore of the housing is clean and free from dirt, grease or contamination before inserting the bearing.

Step 2. Support the part or assembly around the edge of the bearing housing and press the bearing squarely into the housing using a suitable arbor press. For bearings which are located by means of internal flanges, fully seat the bearings in the housing against such flanges. For bearings which float in the housing (i.e., which are to be staked on both sides), centrally position the bearing in the housing before staking.

5.4 Preparation of Staking Tools

5.4.1 Prepare staking tools as follows:

Step 1. Install the pilot mandrels into the staking punch and anvil.

Step 2. Install the applicable adapters (e.g., TS.323.04.21) in the riveting machine (e.g., CP 450 EA).

Step 3. Fit the staking punch and anvil into the adapters in the riveting machine. Visually check the staking tools for evidence of damage or foreign matter which may leave sharp corners or edges in the impressions.

Step 4. Adjust the stroke and pressure of the riveting machine so as to provide only sufficient pressure to press the staking punch indentors fully into the surface of the part.

5.5 Staking Operation

5.5.1 Stake bearings as follows:

Step 1. Lift the upper post of the riveter using the stroke control lever.

Step 2. Place the part in position so that the pilot mandrel on the anvil locates the bearing correctly.

Step 3. Using the stroke control lever, feed the staking punch pilot mandrel into the bearing.

Step 4. Holding the work squarely on the support anvil, depress the foot pedal to apply pressure.

Step 5. Lift the staking punch and remove assembly from the anvil.

Step 6. If double staking is required, turn the work over and stake the other side using the same procedure. Ensure that the bearing remains centrally located in the housing during double staking operations.

5.6 Removal and Re-Installation of Bearings

5.6.1 If necessary, staked bearings may be removed from the housing, by applying pressure to the rim of the outer race only, by means of an arbor press or other suitable tool while supporting the part on the opposite side around the edge of the bearing housing. If possible, push bearings out of the same side of the part housings which they were originally inserted in.

5.6.2 Re-assemble bearings to the part housing into the same side of the part from which it was extracted according to section 5.3. Careful insertion and re-staking will make it unnecessary to stake the opposite face.

5.6.3 Re-stake the bearing using the same staking tools and procedure as specified herein except that when re-staking, offset the staking punch indentors so as to be equi-spaced between the original indentations as shown in Figure 1.

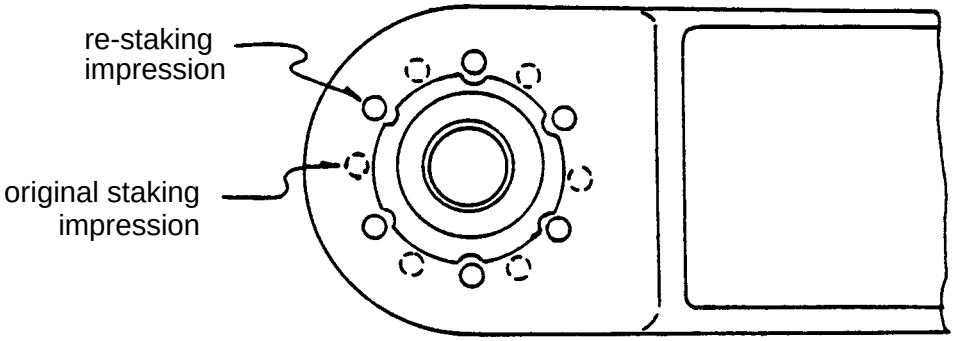


Figure 1 - Re-Staking

6 Requirements

6.1 Ensure that the outer bearing race is located 0.005" - 0.020" below the face of the housing (see Figure 2).

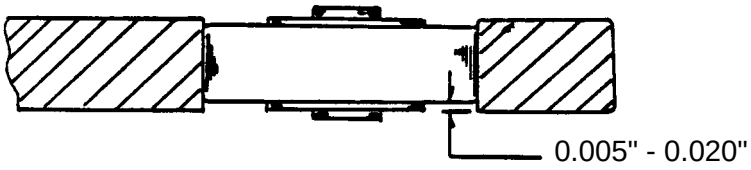


Figure 2 - Positioning of Bearing in Housing

6.2 Ensure that staking indentations are free of sharp corners and only displace sufficient material to secure the bearing in its correct position without causing distortion of the outer race or seizure of the bearing.

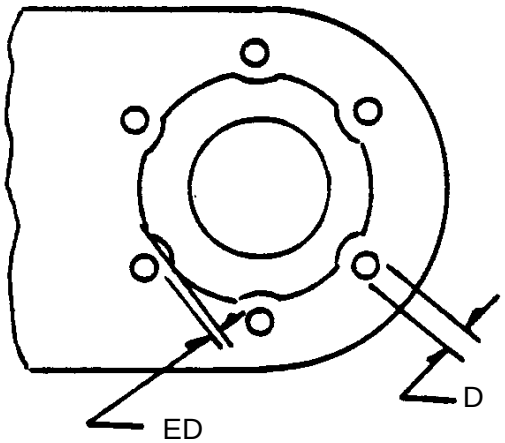
6.3 Evidence of any cracks in the bearing or bearing housing is not acceptable.

6.4 Any deformation or indentation of the bearing or bearing race is not unacceptable.

6.5 Any deformation or indentation of the bearing housing other than that caused by the staking punch indentors is not acceptable.

6.6 Refer to Table 1 for the dimensions of the staking indentations and edge distance from the original perimeter of the bearing housing to the centre of the ball impressions or flat side of the semi-ball impressions. Measure the staking indentations and edge distance with a Brinell microscope or finely graduated scale viewed through a suitable magnifying glass.

Table 1 - Dimensions of Staking Impressions



TYPE OF IMPRESSION	DIAMETER (D)	EDGE DISTANCE (ED
Ball	0.075" - 0.094"	0.040" - 0.060"
Semi-Ball	0.075" - 0.098"	0.040" - 0.060"

7 Safety Precautions

7.1 Observe general shop safety precautions when performing the procedure specified herein.

8 Personnel Requirements

8.1 Personnel responsible for staking of bearings must have a good working knowledge of the procedure and requirements as specified herein and must have exhibited their competency to their supervisor.