AVIM 103D

Aircraft Wheels
Aircraft Wheels

- Usually two piece
- Two opposing conical tapered bearings for each wheel
- Can be tube type or tubeless
- Tubeless will have seal rings or sealing compound between halves
Aircraft Wheels

- Wheels are either aluminum alloy or magnesium alloy
- Are either cast or forged, and therefore can be subject to intergranular corrosion
- The bead seat area and the bolt hole areas are the most critical inspection areas
- The inboard half also houses the brake assembly
Aircraft Wheels

- Commonly has fusible plugs that will release pressure if tire exceeds a critical temperature
- Bearing cups are usually interference fit into each half, or into one half with a flange for the other half
- Inflation valve, or hole is usually on the outboard half
Aircraft Wheels

- Aircraft tires are generally removed by splitting the wheel in half
- Must not have any air pressure in tire when loosening bolts, (remove valve core)
- Can use an arbor press or drill press, turned off, to press bead off of rim, on both sides
- Wheel inspection is critical for cracks, corrosion, or damaged bead/bolt areas
Aircraft Wheels

› If any fusible plug shows sign of damage, replace all of them

› Eddy current inspection is the best way to check for subsurface damage

› Fix a flat tire injection formulas can contain explosive gasses

› Cracks can also develop in the brake disc mounting areas
Aircraft Wheels

- Bolts may be unidirectional - interference
- Tighten in a criss cross pattern, in stages
- Do not use soap on tube type tires, the sudden acceleration of landing will cause them to slip
- Mount the tire with red dot to the valve stem
- When reassembling tube types be careful to not pinch the tube or leave any wrinkles
Aircraft Wheels

- Tapered conical wheel bearings
- Slightly loose is better than slightly too tight
- Notch in plate washer is used to move washer to test for correct tension
- Spin wheel when adjusting wheel bearings
- Always thoroughly clean and regrease bearings and wheels when halves are separated
Aircraft Wheels

- Always replace both the bearing assembly and the bearing cup when replacing a bearing.
- Some axle seals can be reused, but most lip seals should be replaced when removed.
- Always renew cotter pin.
- Make sure cotter pin isn't dragging on dust cap or flange. Builds static charge that can wreck havoc on many things.
Aircraft Wheels

- Wheels bearings usually fail due to contamination or being set too tight.
- Heat discoloration, brinelling, spalling, galling, and welding are the stages of wheel bearing failure.
- Bearing cup can wallow loose in wheel half.
- Always replace bearings by part number only.
Aircraft Wheels

- It is best to use boiling water and ice to change bearing cups
- Any damage to metal or plastic bearing cage is cause for rejection of the bearing
- DO NOT, FOR ANY REASON, AIR SPIN A BEARING RACE OF ANY TYPE
- Replace any bearing with rust, or water marks
Aircraft Wheels

- Bearing lubrication
- MIL-G-3545C or MIL-G-81322
- Coloration of grease is due to dyes used by manufacturer
- Some extra grease in the hub area will assist in heat dissipation
- Too much grease will push the wheel seals out
Aircraft Wheels

- Pressure packing bearings is the quickest way, always keep grease systems very clean.
- Hand packing is done by working grease into bearing cage dragging cage lip across a hand full of grease.
- Do not contaminate the brake components with wheel bearing grease.
- Repacking wheel bearings is P.M.
Wheel Types

• Drop Center (Single Piece)
  – Tire bead forced over rim (automotive)
• Demountable (Removable) Flange
  – Easier tire mount and dismount for stiffer tires
• Split Center (Split Rim)
Wheel Materials and Manufacture

- Aluminum alloy or Magnesium alloy
- Cast or Forged
- O-ring between wheel halves - Tubeless
- Knurled flanges (on some wheels) - Tube
Wheel Classification for Tire Casing

• Type I - Smooth contour
• Type II - High pressure
• Type III - Low pressure
• Type IV - Extra low pressure
• Type VI - Low profile
• Type VII - Extra high pressure
• Type VIII - Extra high pressure – Low Profile
Drop Center Wheel

Figure 78. Wheel and axle assembly
Figure 6-48. Fixed-flange, drop-center wheel
Demountable (Removable) Flange

For proper balance, align marks (if provided) on wheel and flange during assembly.
Demountable (Removable) Flange

- Snap ring
- Grease retainer
- Fairing disc
- Fairing retaining screw
- Bead seat area
- Removable flange
- Roller bearing
Split Center (Split Rim)
Inboard Wheel Half

- Steel reinforced keyways or steel keys
- Bearing cup (interference fit)
- Tapered caged roller bearing
- Grease seal, two retainers and snap ring
- Fusible plug(s)
- Over-inflation valve (on very large wheels)
  - May also be mounted on outboard wheel half
Split Center (Split Rim)
Figure 77. Wheel with bearing and grease retainers removed
Outboard Wheel Half

- Bearing cup (interference fit)
- Grease seal, two retainers and snap ring
- Inflation valve (tubeless tires) or hole for inner-tube valve stem
- Axle cap and retaining ring
- Anti-skid bracket attached to cap
On Aircraft Wheel Inspection

- Light aircraft verify proper tire pressure daily
- Heavy aircraft verify before each flight
  - Tire cool, or at least 2 to 3 hours after flight
- Check wheel weight security
- Brake tangs must align with wheel slots
- Axle nut torque
  - Too loose, bearing cup could spin
  - Too tight, damaged bearing
Off Aircraft Inspection

• **Deflate tire first**
• Break the bead
• Remove and properly store bearings
• Note wheel weight location
• Remove tie bolts
• Clean wheel assembly
• Clean and inspect bearings
Do Not:
Pry between wheel halves
Nick or scratch wheel rim or bead seat area
Damage tire bead
## Bearing Inspection

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Galling</strong></td>
<td>Damage caused by the rubbing of mating surfaces. When localized high spots rub against each other they become heated by friction enough to weld together. As they continue to move, the welded areas pull apart and destroy some of the surface.</td>
</tr>
<tr>
<td><strong>Spalling</strong></td>
<td>Damage in which chips are broken from the surface of a case-hardened material such as a bearing race. Spalling occurs when the bearing race is placed under a load great enough to distort the softer inner part of the metal and cause the hard, brittle surface to crack. Once a crack forms in the surface, chips break out.</td>
</tr>
<tr>
<td><strong>Brinelling</strong></td>
<td>Damage to the hardened surface of a bearing roller or race caused by excessive radial loads. When the bearing is overloaded, the rollers are forced into the race, and they leave small dips, or indentations, in the race on the surface of the roller.</td>
</tr>
<tr>
<td><strong>Water stain</strong></td>
<td>Black discolorations on bearing races and rollers where the surfaces were in contact in the presence of water. This discoloration is an indication of intergranular corrosion within the material.</td>
</tr>
<tr>
<td><strong>Discoloration from overheating</strong></td>
<td>Blue marks of the bearing rollers indicate that the bearing has been operated dry, or has been subjected to too high a rotational speed.</td>
</tr>
<tr>
<td><strong>Rust</strong></td>
<td>Rough red deposits on any of the rolling surfaces indicate that the bearing has been left unprotected from moisture in the air. Rust leaves pits that ruin the bearing surfaces.</td>
</tr>
</tbody>
</table>
Water Stain - Reject
Spalling - Reject
Overheated – Reject
Bearing Cup Replacement

Avoid excessive heat that will impair wheel heat-treatment

Removal

• Heat wheel
  – Boiling water for 1 hour
  – Oven for 30 minutes at 225°F.
• Tap cup out with fiber drift

Replacement

• Reheat wheel
• Chill cup with dry ice
• Coat cup exterior with zinc chromate primer
• Drift cup in with fiber drift
MIL-G-81322 (most common)

MIL-G-3545

Work grease around each roller

Wrap bearing assembly in waxed paper

Coat bearing cup with grease
Inspect Wheel Halves

• Bead seat
  – Eddy current inspection
• Keys or Key slots
  – Dye penetrant, Magnetic particle, Dimensional
  – Check key attachment screw stake
• Internal and external surfaces
  – Dye penetrant, Dimensional
• Bolts and other hardware
  – Magnetic particle
Rolled (pre-stressed with a compressive load) for increased tensile strength
Inspect Wheel Halves

- Fusible plug(s)
  - Visual, replace all if any distorted
- Corrosion
  - Check bead seat for trapped water
  - Remove corrosion per manufacturers’ instructions
  - Treat aluminum surfaces with Alodine
  - Treat magnesium surfaces with Dow 19
  - Finish with two coats zinc chromate primer (except mating surfaces and bolt bosses – one coat only)
Fusible Plugs
Reassemble Wheel (Tubeless Tire)

- Clean bead seat area – isopropyl alcohol
- Usually inboard wheel half first
  - Inspect and lubricate wheel O-ring (tubeless)
- Install tire on inboard wheel half
- Index outboard wheel half so that red dot on tire is adjacent to inflation valve
- Lubtork bolts, washers and nuts if specified
- Torque per manufacturers’ recommendations
- Inflate tire in cage to ½ static inflation pressure
- Final tire inflation or adjustment on aircraft
Reassemble Wheel (Tube Tire)

- Clean bead seat area – isopropyl alcohol
- Prepare and position inner tube
- Prepare and position tire
- Position brake disk (Cleveland brakes)
- Lubtork bolts, washers and nuts if specified
- Torque per manufacturers’ recommendations
- Inflate tire in cage to ½ static inflation pressure
- Adjust axle nut torque
- Final tire inflation or adjustment on aircraft
2006 Mechanic Killed B737 Nose wheel Tire
166 PSI required—exposed to 3000 PSI from unregulated nitrogen cylinder.
Cleveland 40-76A
P38 Main Gear Wheel

Goodyear P/N 731029M  $1000.00
T38 Nose
END
SECTION
SEVEN