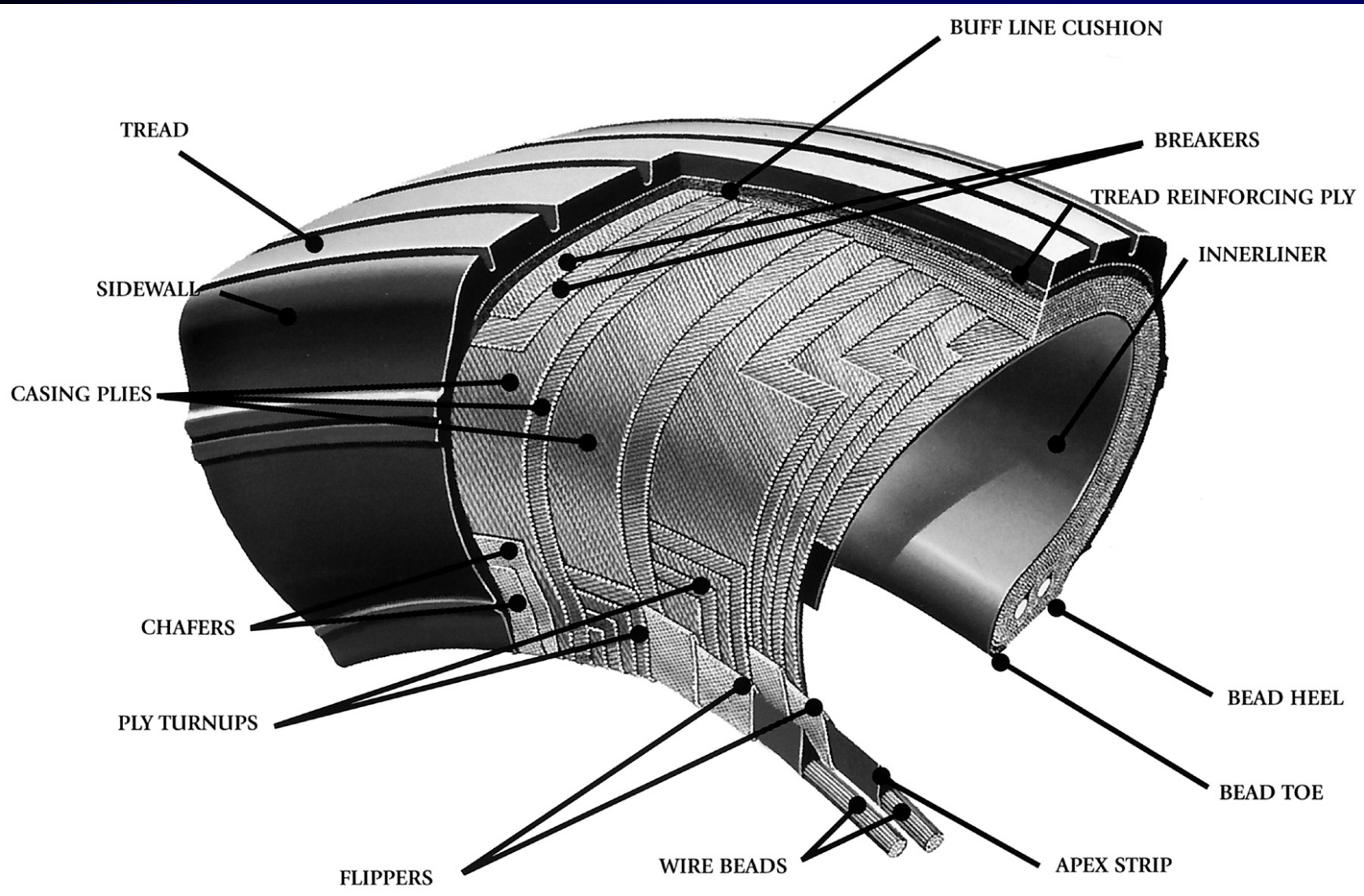
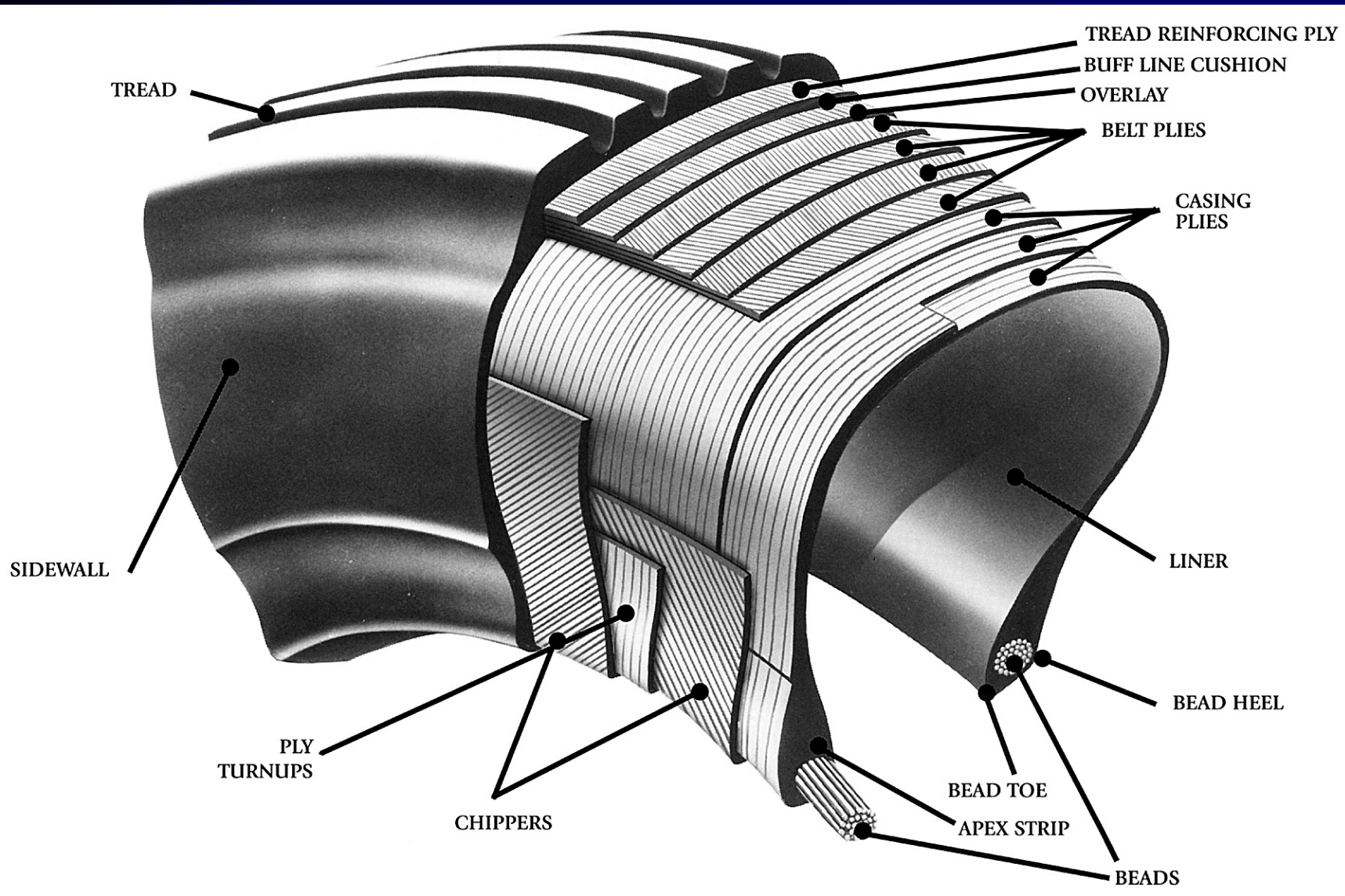


# Bias Aircraft Tire Construction



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AVIATION

# Radial Aircraft Tire Construction




**GOOD YEAR**  
AVIATION

# Goodyear Flight Custom III

INTRODUCING

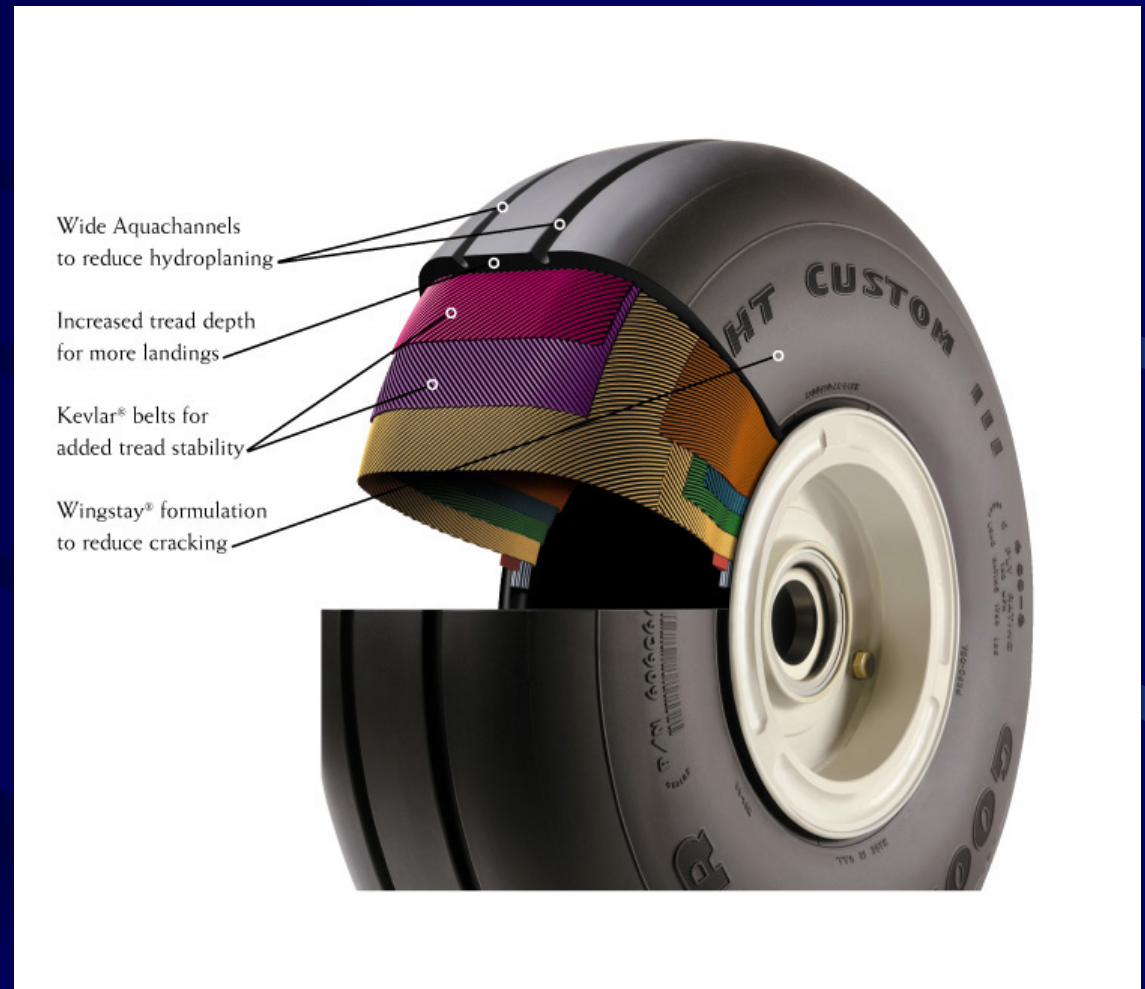
**FLIGHT CUSTOM III**



**GOODYEAR**

Deeper tread depth.  
Dual polymer tread compound.  
And a Kevlar® belt package that takes more punishment than you can dish out.  
**More landings on the wings of Goodyear.**

Kevlar® is a registered trademark of DuPont.



**GOODYEAR**  
AVIATION



# Goodyear Flight Custom III

- Replaces market leading FCII in popular sizes
- Fully interchangeable with FCII
- Two grooves for better wear
- Wider grooves reduce hydroplaning
- Deeper grooves for more landings
- Kevlar belts for tread stability
- All of these add up to **MORE LANDINGS**

# Flight Mate Tube



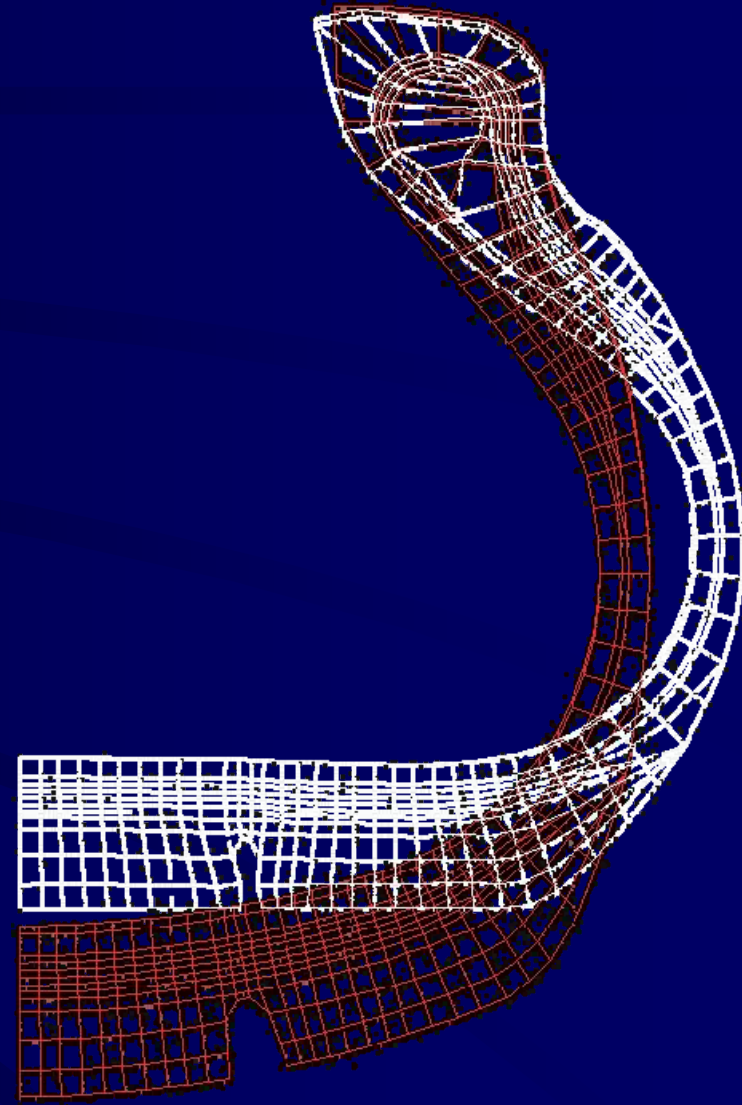
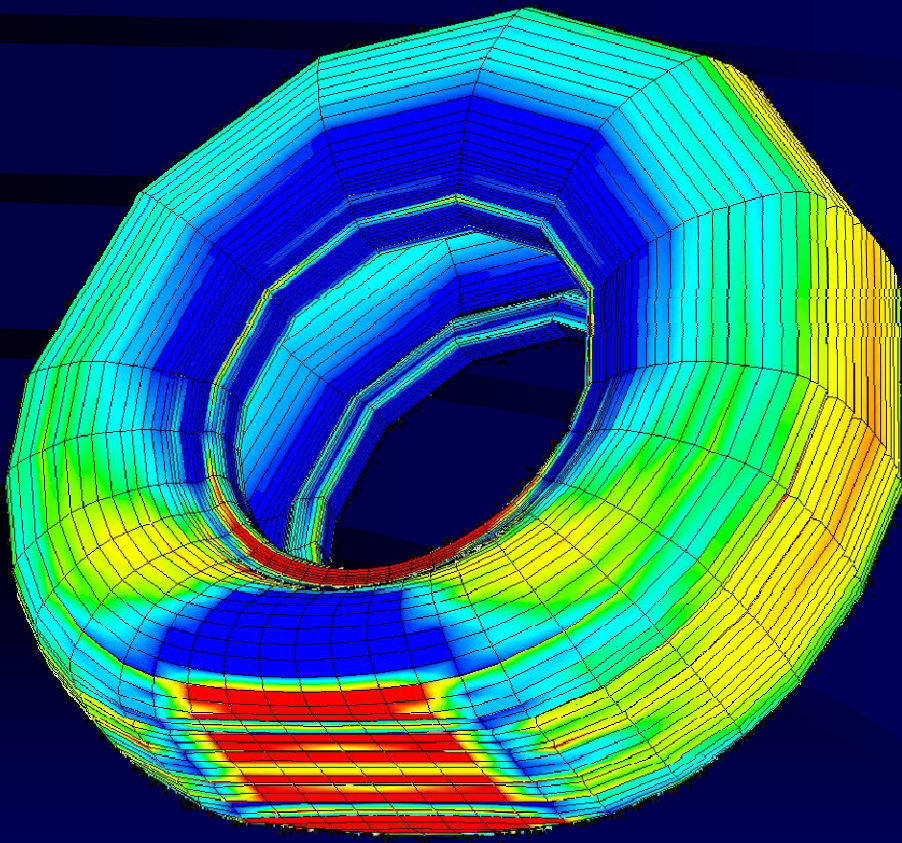
- Butyl rubber construction
- 10X better air retention
- Low temperature (-58°F)
- Made to SAE spec AS50141
- Tested at Embry-Riddle

# Aircraft Tires vs Car Tires

Parameter	Aircraft	Passenger
Size	27x7.75-15	P205/75R15
Diameter	27.0"	27.1"
Section Width	7.75"	7.99"
Load Rating	9650 lbs	1598 lbs
Pressure	200 psi	35 psi
Deflection	32%	11%
Max Speed	225 mph	112 mph
Load/Tire Weight	244	78

# Inflation & Deflection

→ Normal deflection





# What makes Aircraft Tires so Unique?

→ Aircraft Tire operating conditions are very different from any other tire application.

- **Intermittent Service** Usage allows higher loads, speeds, deflections and pressures.
- This results in much **higher temperatures** being generated during use & no equilibrium.
- This mandates the use of **special materials**,
  - natural rubber compounds
  - specialty woven nylon cords.





# “On the Edge”

- The Aircraft Tire operates on the outer edge of the performance envelope.
  - Highest combination of load & speed
  - Highest Deflections
  - Smallest Package Size (load to weight ratio).
  
- Consequently, it is less forgiving of abuse & neglect.
  - Tire pressure maintenance is crucial to ensure safe & reliable performance throughout the tire’s life.

# Preventive Maintenance - Inflation



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# Preventive Maintenance - Inflation

## → Underinflation

- Accelerates shoulder tread wear
- Shortens tire life due to flex heating

## → Overinflation

- Accelerates centerline tread wear
- Increases stress on wheels and landing gear

→ Keeping tires correctly inflated is the most important factor in any maintenance program

# Preventive Maintenance - Inflation

1. Check daily when tires are cool
  - Tire/wheel can lose up to 5% per day
2. Inflate to worst conditions
  - 5° F temp change produces 1% pressure change
3. Use dry nitrogen gas when required
  - Non-combustible and non-oxidizing
  - AD-87-08-09
4. Increase pressure 4% when loaded
  - Check aircraft manual for correct pressure



# Preventive Maintenance - Inflation

5. Allow 12-hour stretch after mounting
  - Tires grow with initial inflation and first cycles
6. Never reduce pressure on a hot tire
  - Temps can rise 200°F during operation
7. Equal pressure for duals
  - Mate tire will share load
8. Calibrate inflation gauge regularly

# Preventive Maintenance - Inflation

- Check inflation daily or before first flight
- If “in service” pressure is less than minimum (Per RMA and FAA AC 20-97B):

Cold Tire Loaded Service Pressure	Recommended Action
95 < 100%	Reinflate
90 < 95%	Inspect, reinflate, & record
80 < 90%	Remove tire
< 80%	Remove tire & mate

# Temperature Effects on Pressure

## The Math

Each 5 Deg change F = 1% change in internal PSI

Each 3 Deg C =1% change in internal PSI

## Example

### Aircraft going from Dallas to Calgary

Dallas 100 Deg F

Calgary 0 Deg F

Starting Tire Pressure in Dallas = 200 PSI

Difference in Temp Dallas to Calgary =100 Degrees F

Change in pressure inside tire at Calgary (40PSI lower)

$100/5 = 20\%$      $20\%$  of 200PSI=40PSI

1. Best Strategy is to avoid under inflation in @ Calgary

Overinflate by 50PSI at Dallas Prior to Departure.

$250\text{PSI} \times 0.8 = 200\text{PSI}$  when at Calgary

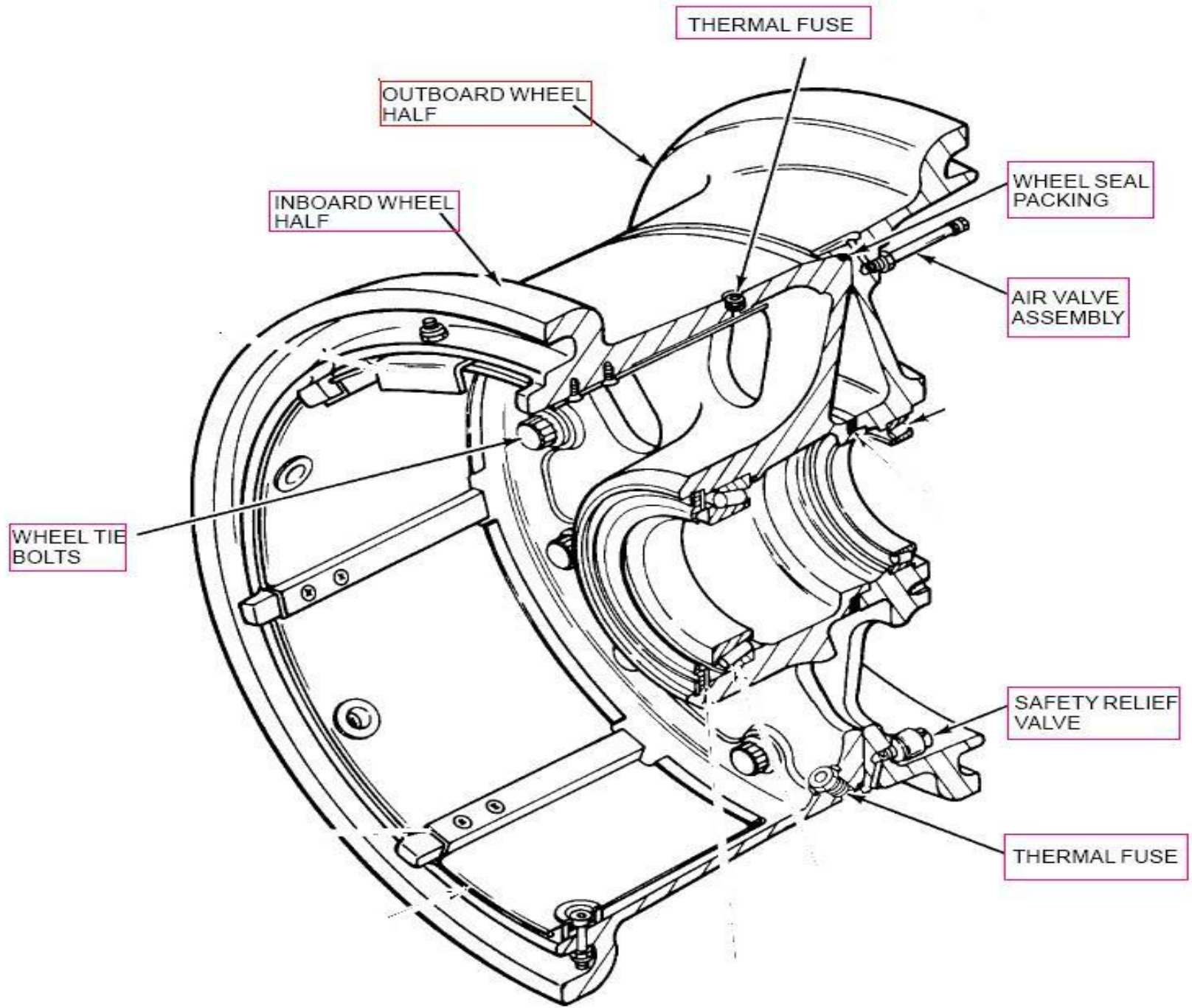
2. Second Best Strategy is to wait until aircraft lands at Calgary then:

Add 40PSI @ Calgary

( $200\text{PSI} \times 0.8 = 160\text{PSI}$  on Landing at Calgary)

Strategy #2 has higher likelihood of causing tire damage







# Potential Wheel Leak Components



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# Preventive Maintenance - Inflation

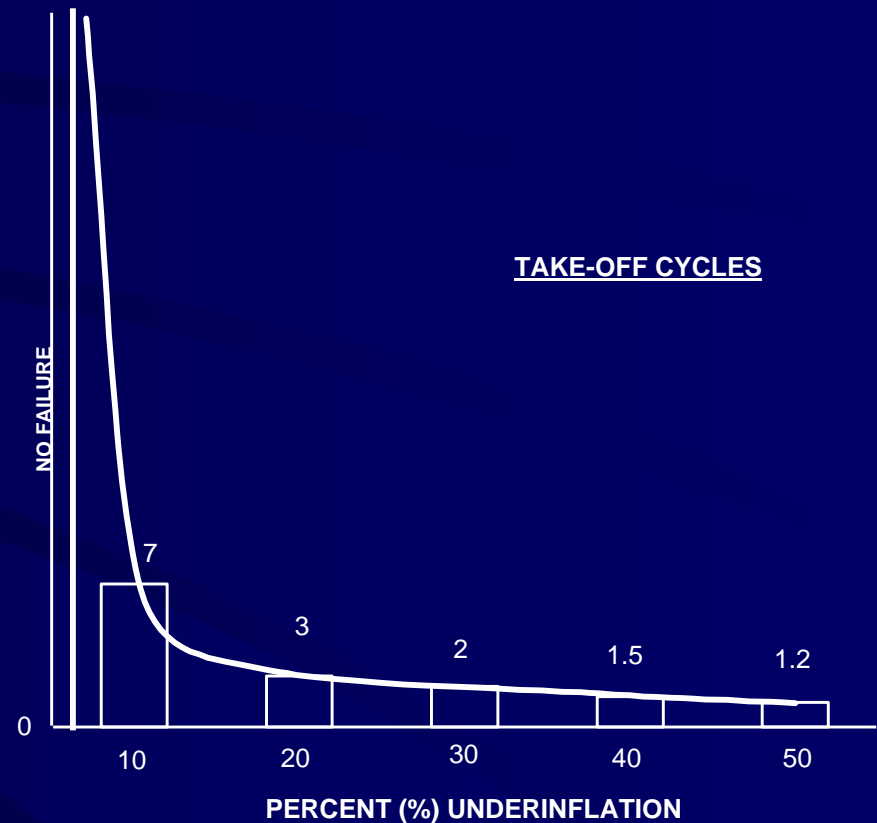
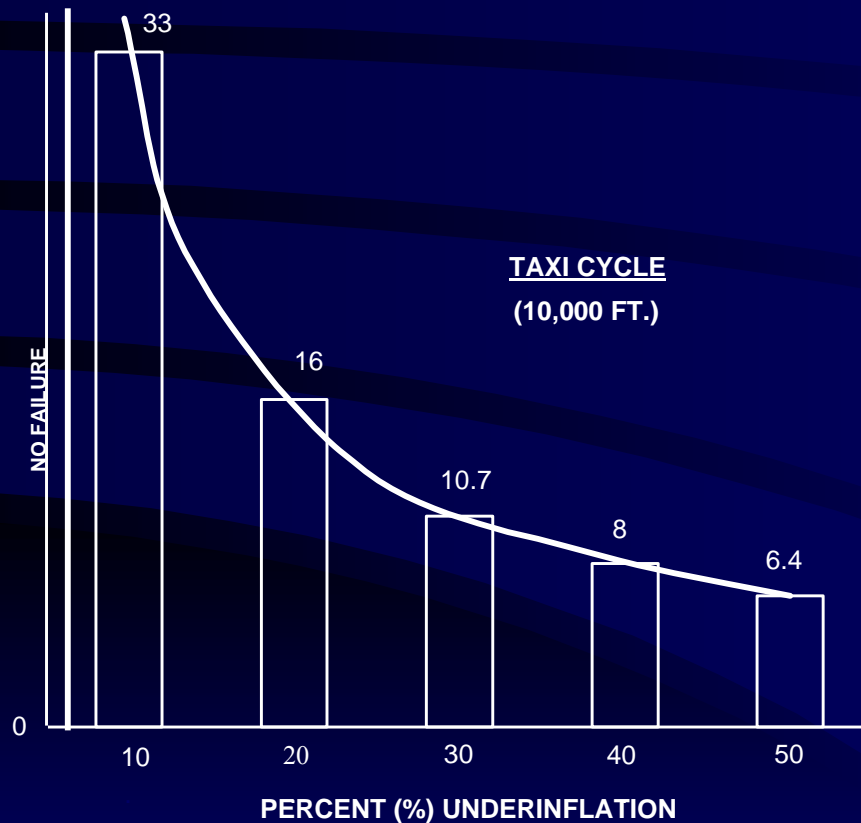
## → UNDERINFLATION

- Overdeflection
- Liner Wrinkles
- Tread Loss
- Sidewall Blowout
- Aircraft Damage
- Loss of Directional Control



# Preventive Maintenance - Inflation

## Cycles to Failure vs Underinflation





# Preventive Maintenance - Storage

- Store in a cool, dry place out of sunlight
- Avoid ozone generators:
  - Fluorescent lights
  - Electric motors and generators
  - Battery chargers
- Avoid exposure to contaminants
- Store vertically in tire racks and use FIFO
- Store tubes in boxes or in matching tires
  - Do not hang over nails, pegs, etc.



# Preventive Maintenance - FOD

## → Foreign Object Damage (FOD)

- Airport maintenance
  - Keep hanger floors clean
  - Report pavement breaks and debris
- Nuts, bolts, rivets, rocks, etc. will easily cut aircraft tires

→ FOD is #1 cause of early tire removals

# Foreign Object Damage (FOD)

→ Objects removed from commercial aircraft tires



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# Mounting & Demounting



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# Before Mounting – Tire Size

## → Tire diameters vary

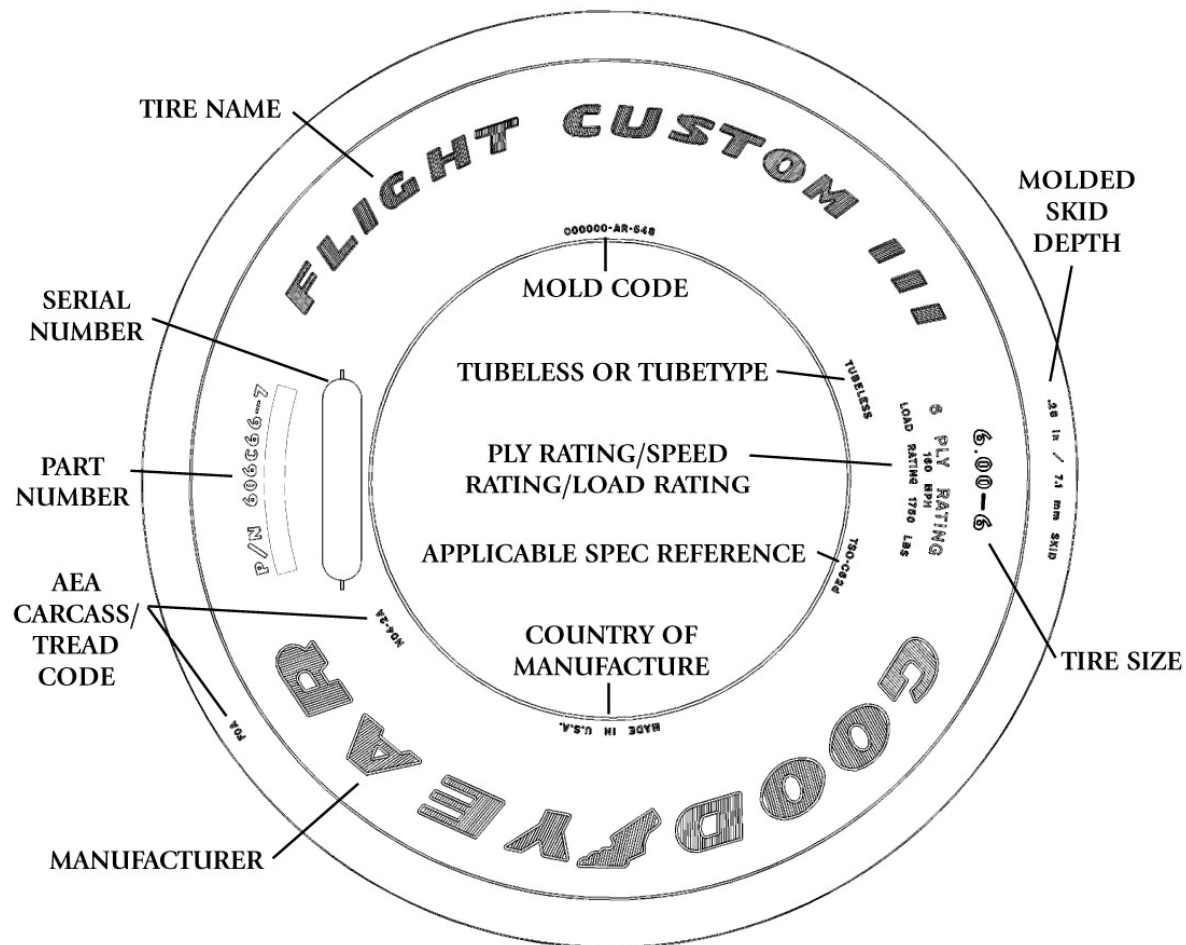
- New, worn, retread, different manufacturers, etc.
- All unworn tires should meet Tire and Rim dimensions
- For example, a 6.00-6 inflated OD range is 16.8-17.5”

## → Replace nose tires in pairs if required by AMM

## → Use caution on retractable homebuilt aircraft



# Before Mounting - Tire Sidewall Info



# Before Mounting - Serial Numbers

→ Provide a unique identification

→ Goodyear S/N's always 8 digits

- position 1 signifies year: 5 = 2005, 1995, etc.
- positions 2-4 signify day of year (Julian date)
- position 5 signifies plant of manufacture
- positions 6-8 are a plant numeric

→ Examples

- S/N 50341234 was cured February 3, 2005



# Mounting

## ➔ Tube-type Tires

- Do not reuse an old tube in a new tire
- Lightly lubricate tube with talc
- Inflate, deflate, and reinflate
- Stretch tire for 12 hours, then reinflate
- Perform a 24-hr diffusion test
- Sources of inflation loss in tube-types
  - Trapped air between tire and tube
  - Valve core leakage
  - Damaged tube

## ➔ Tubes can be used in tubeless tires

- Remove stickers





# Mounting

## → Tubeless Tires

- Check for words “Tubeless” on the tire
- Torque bolts properly
- Inflate to correct pressure using dry nitrogen
- Check for proper bead seating at the wheel flange
  - Bubbles at the wheel flange indicate poor seating
  - Small bubbles at the tire vents (**green dots**) are normal
- Stretch tire for 12 hours, then reinflate
- Perform a 24-hr diffusion test



# Mounting

## → Inflation Loss in Tubeless Assemblies

- Valve, valve core, or valve seal
- Fuse plug
- Pressure release plug
- O-ring seal
- Wheel base and flanges
- Tire

→ Up to 5% loss in 24 hours is acceptable

# Mounting

## → Vents (a.k.a. weepholes)

- Located under the green or white dots
- Allow air trapped during building to escape
- Relieve pressure buildup in the casing
- Do not seal up over time

→ Up to 5% loss in 24 hours is acceptable





# Mounting

## → Balancing

- Tires are balanced tighter than FAA requirements
  - The **red dot** indicates the light spot of the tire
  - Balance pads are commonly installed at this point
  - If **red dot** is missing, balance pad marks the light spot
- Tubeless: align wheel valve with **red dot**
- Tube-type: align valve stem on tube with **red dot**



# Mounting

## → Factors affecting vibration

- Flat-spotted tire due to wear and braking
- Gear alignment
- Gear sensitivity and damping
- Improperly assembled tubeless tire/wheel
- Improperly installed tube
- Installation of assembly before full tire growth
- Improperly torqued axle nut
- Loose Torque Links or other bushings
- Use of non-aircraft tubes





# Demounting

1. Completely deflate tire with deflation cap
2. Remove the valve core
  - Ensure pressure is relieved first
3. Unseat tire beads with a bead breaker
  - Place bead breaker one inch above wheel flange
4. Loosen wheel bolts only after breaking beads

**Caution** - If wheel or tire damage is suspected:

- Allow tire to cool to ambient before approaching
- Approach from front or rear, not from wheel side

# Inspection - How Do the Tires Look?



*Care to Hazard a Guess?*

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# Inspection - How Do the Tires Look?



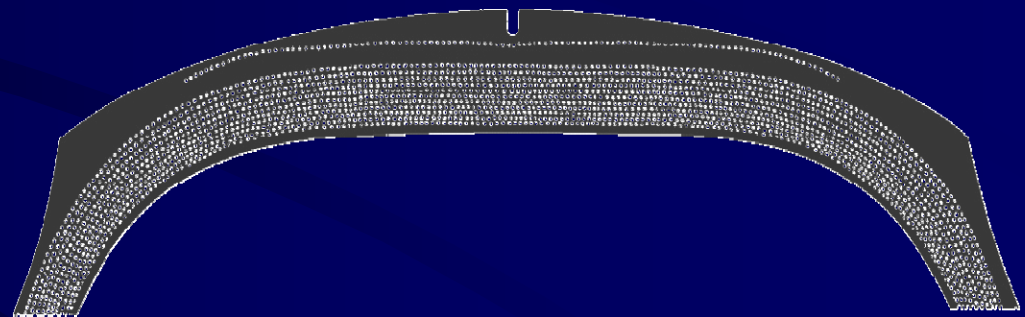
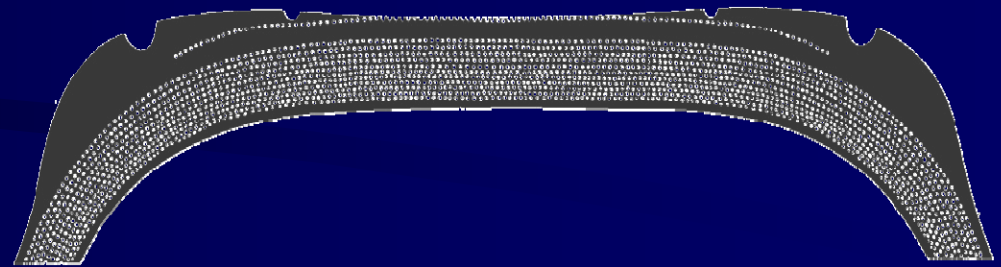
- Three tires are *215 psi*
- Right front tire is *170 psi*
  - *45 psi low (21%)*
- Per FAA:
  - *Both front tires should be removed*

Underinflation can't be detected just by looking!

# Tread Inspection

## → Tread Wear

- Removal criteria
  - Worn to base of groove
  - If fabric is visible
- Gear-related uneven wear OK
  - Tires can be flipped



→ Remove these tires

# Tread Inspection

## → Tread cuts

- Result of FOD
- Removal criteria
  - Cut to bias casing plies
  - Cut to fabric on radials
  - If cut extends to fabric across one or more ribs
  - If rib undercutting

→ This tire is OK



# Tread Inspection



## → Chunking

- Due to rough runways
- Remove if fabric is visible

→ This tire is OK

# Tread Inspection



→ Chevron cutting

- Caused by cross-grooved runways
- Remove if fabric is visible

→ This tire is OK

# Tread Inspection



## → FOD

- Caused by rolling over foreign objects
- DO NOT PROBE while inflated

→ Remove this tire



# Tread Inspection – Uncommon FOD



# Tread Inspection

## → Skid spot

- Caused by skidding
- Removal criteria
  - If worn past limits
  - If it causes vibration

→ Remove this tire



# Tread Inspection



## → Skid burn

- Reverted rubber in skid
- Caused by hydroplaning
- Removal criteria
  - If worn past limits
  - If it causes vibration

→ This tire is OK



# Tread Inspection

## → Casing flat spotting (nylon set)

- Due to aircraft inactivity over extended time
- Flat spots normally disappear during taxi
- Can be avoided by:
  - Occasionally moving a non-flying aircraft
  - Jacking aircraft if parked more than 30 days

# Tread Inspection

## → Groove cracks

- Various causes
  - Improper storage
  - Underinflation
- Removal criteria
  - If fabric is visible
  - If crack undercuts rib

→ This tire is OK



# Tread/Sidewall Inspection

## → Bulges

- Indicate separation
- Caused by excessive heat from overdeflection



→ Remove this tire

# Tread/Sidewall Inspection



## → Contamination

- Various causes
  - Fuels
  - Oils
  - Hydraulic fluids
  - Skydrol
- Clean with denatured alcohol or soap and water
- Remove if spongy rubber

Remove this tire

# Sidewall Inspection

## ➔ Sidewall Damage

- Various causes
  - Ozone cracks
  - Weather checking
  - Cuts from FOD
- Remove if fabric is visible

➔ This tire is OK



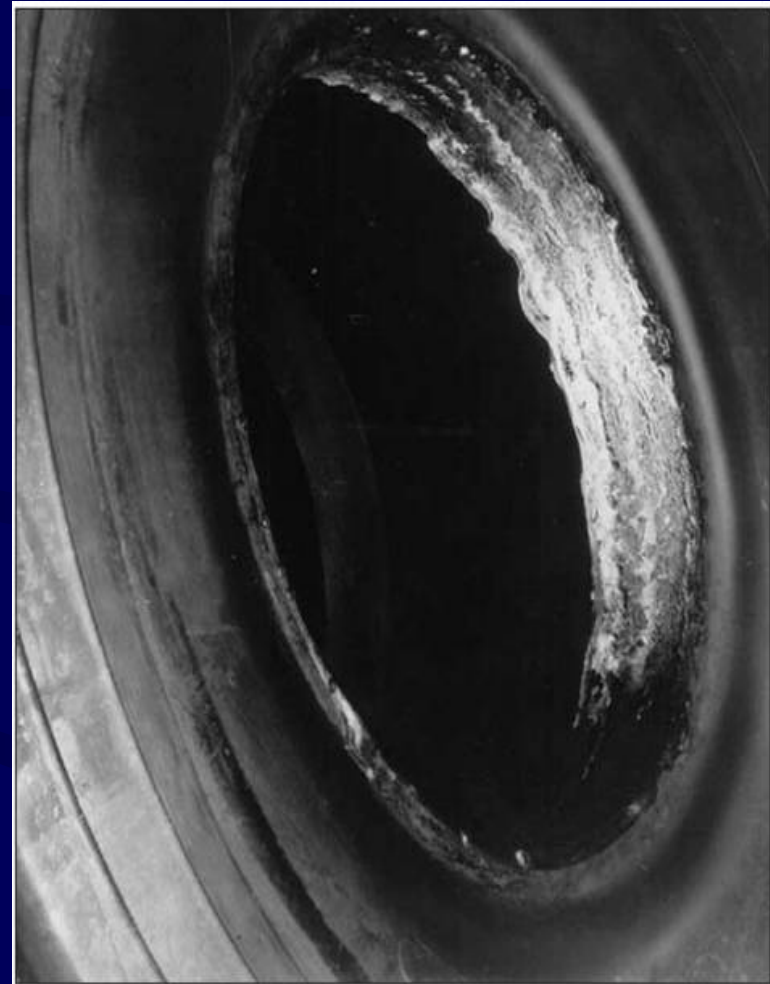


# Bead Inspection

## ➔ Heat Damage

- Various causes
  - Dragging brake
  - RTO or severe braking
  - Underinflation
- Remove if significant bluing or rubber flaking

➔ Remove this tire



# Bead Inspection



→ Exposed chafer

- Various causes
  - Poor bead seating
  - Underinflation
  - Thin rubber gauge
- Exposed fabric OK
  - Unless wheel is damaged

→ This tire is OK



# Aircraft Operation

- Land at correct point
  - More time for thrust reversers and/or drag
- Land at correct speed
- Turnoff selection
- Max thrust reversers (if applicable)
- Don't ride brakes on taxi



# Care & Maintenance

→ INFLATION

→ INFLATION

→ INFLATION

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# Care & Maintenance - Inflation

- Check daily when tires are cool
- Inflate to worst conditions
- Use dry nitrogen gas when required
- Pressure increases 4% when loaded
- Allow 12-hour stretch after mounting
- Never reduce pressure on a hot tire
- Equal pressure for duals
- Calibrate inflation gauge regularly



# Free Aircraft Tire Information

→ Authorized Goodyear Distributors

→ [www.goodyearaviation.com](http://www.goodyearaviation.com)

- Care & Maintenance Manuals

- Aircraft Tire Data Book

- Interactive CD

→ FAA AC 20-97B

- “Aircraft Tire Maintenance and Operational Practices”



# Questions?



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