TIRE WEAR

John Salamankas

Tire Wear

“Tires are one of the most underrated and least understood components on the aircraft.”

Tire Wear

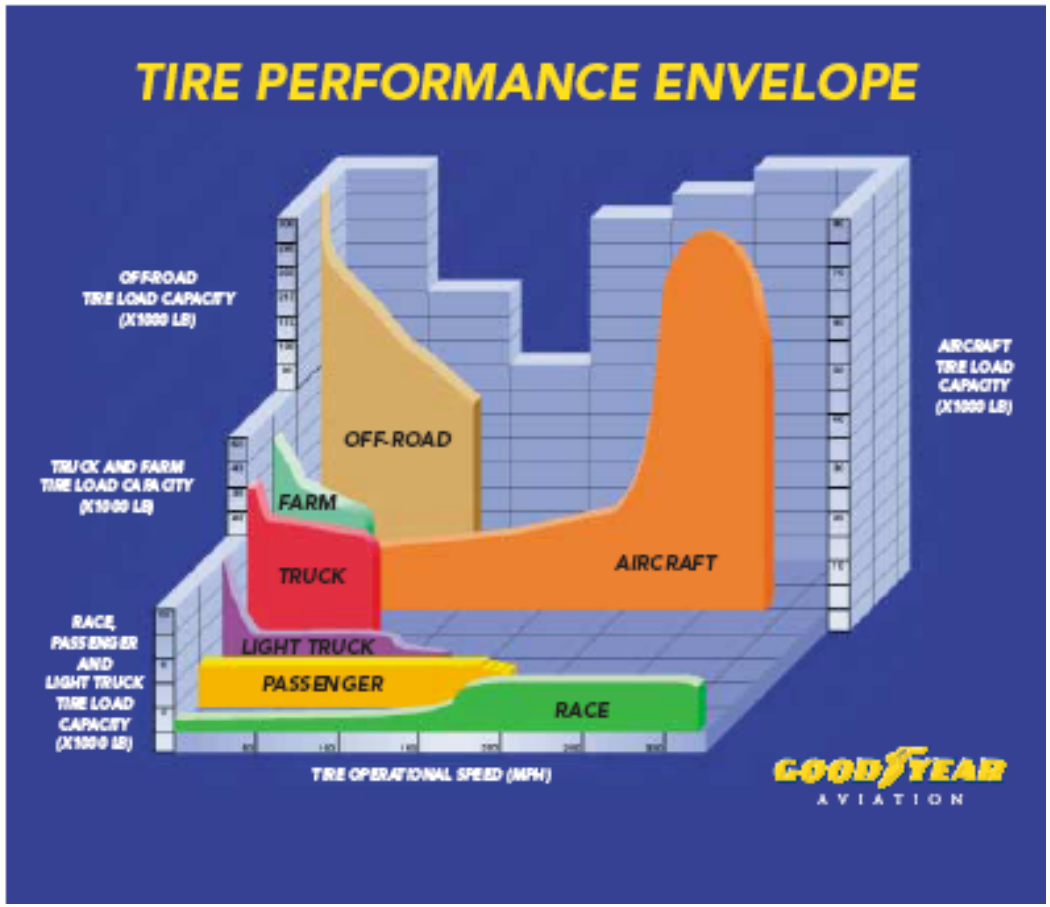
OUTLINE

- Pilot's perspective
  - Oversee care
  - Contribute to wear
- Tire facts
- Wear
- Damage
- Proper Care

Importance of Proper Care

Importance of Proper Care

Tire Performance Envelope



Aircraft speed and load requirements are most severe

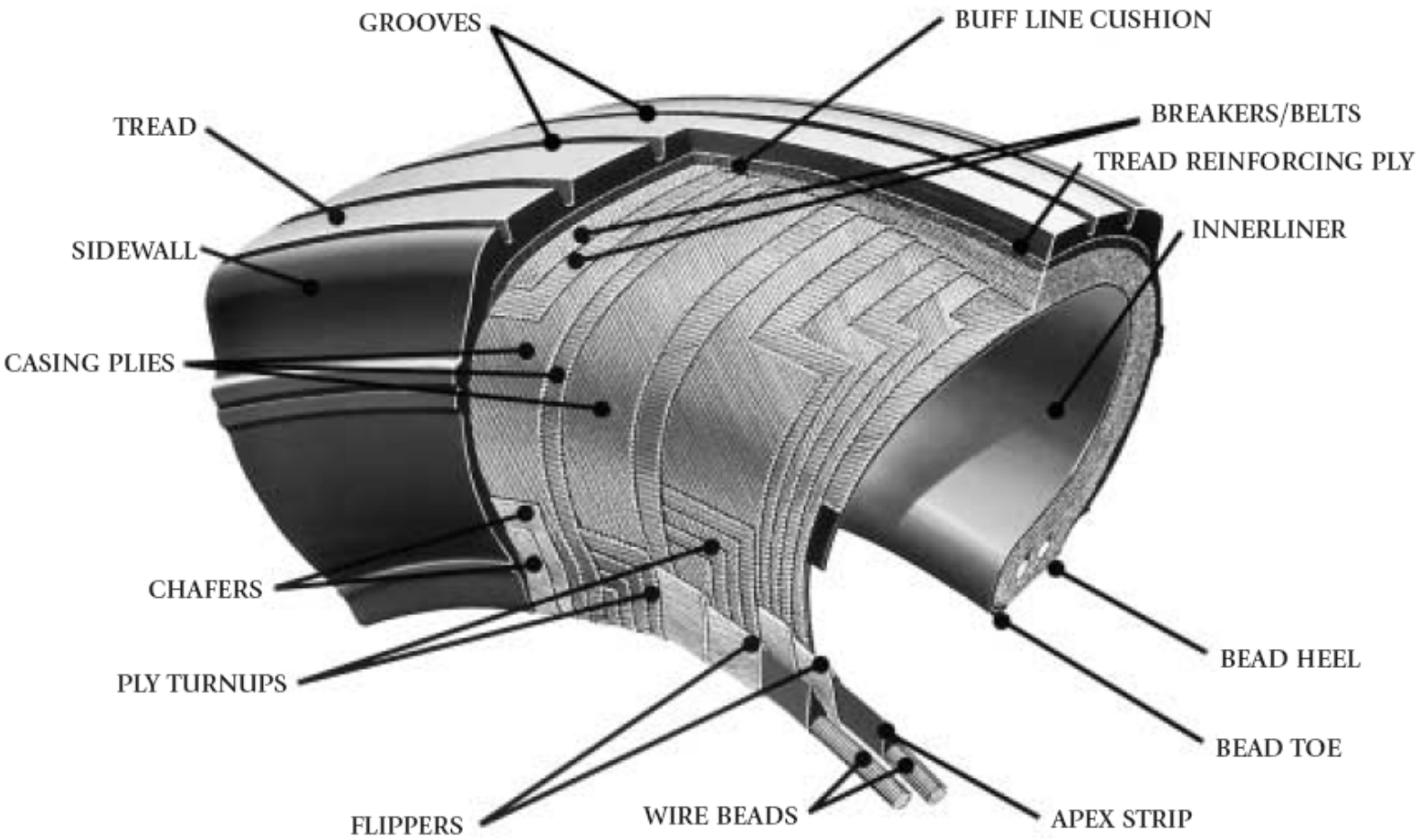
Tire Design Requirements

- **Low ground bearing pressure, best “flotation”**
  - **Large amount of deflection**
- **Intermittent, short term operation**
  - **Can tolerate greater deflection**
- **Compared to automobile tires**
  - **3 times the speed**
  - **3 times the deflection (30% vs. 10%)**
  - **6 times the pressure**
  - **13 times the load**

Tire Design Requirements

- **TSO-C62e "Aircraft Tires**
  - **Dynamometer testing (same tire)**
    - **50 takeoff cycles at maximum load and speed**
    - **10 takeoff cycles at 150% load**
    - **Taxi cycle matrix**
  - **Inflation to 4 times rated maximum for 3 seconds**
  - **No degradation of tire material properties after:**
    - **-40º F for 24 hours**
    - **+160º F for 24 hours**
    - **300º F for 1 hour at wheel-tire bead seat**

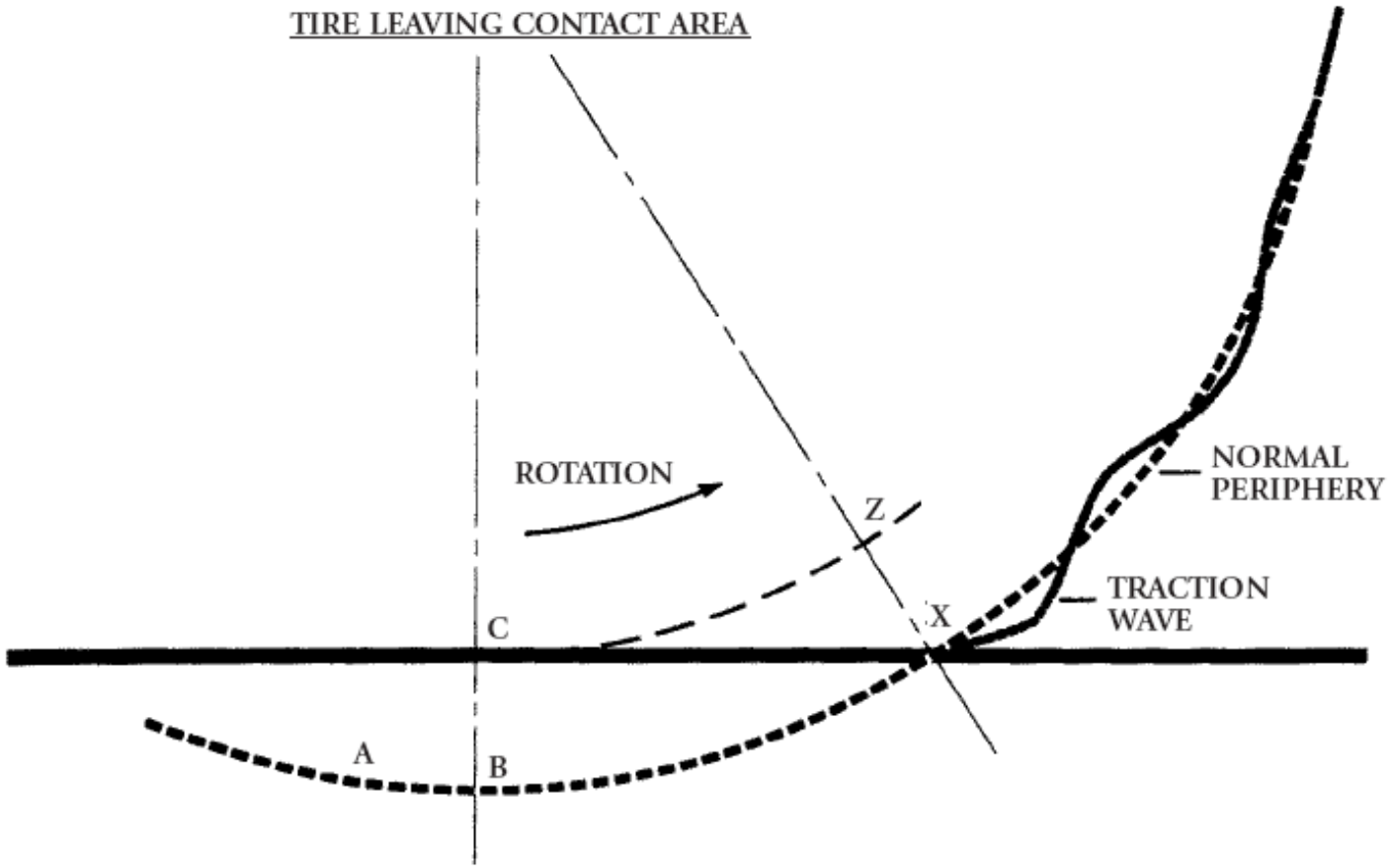
Aircraft Tire Construction



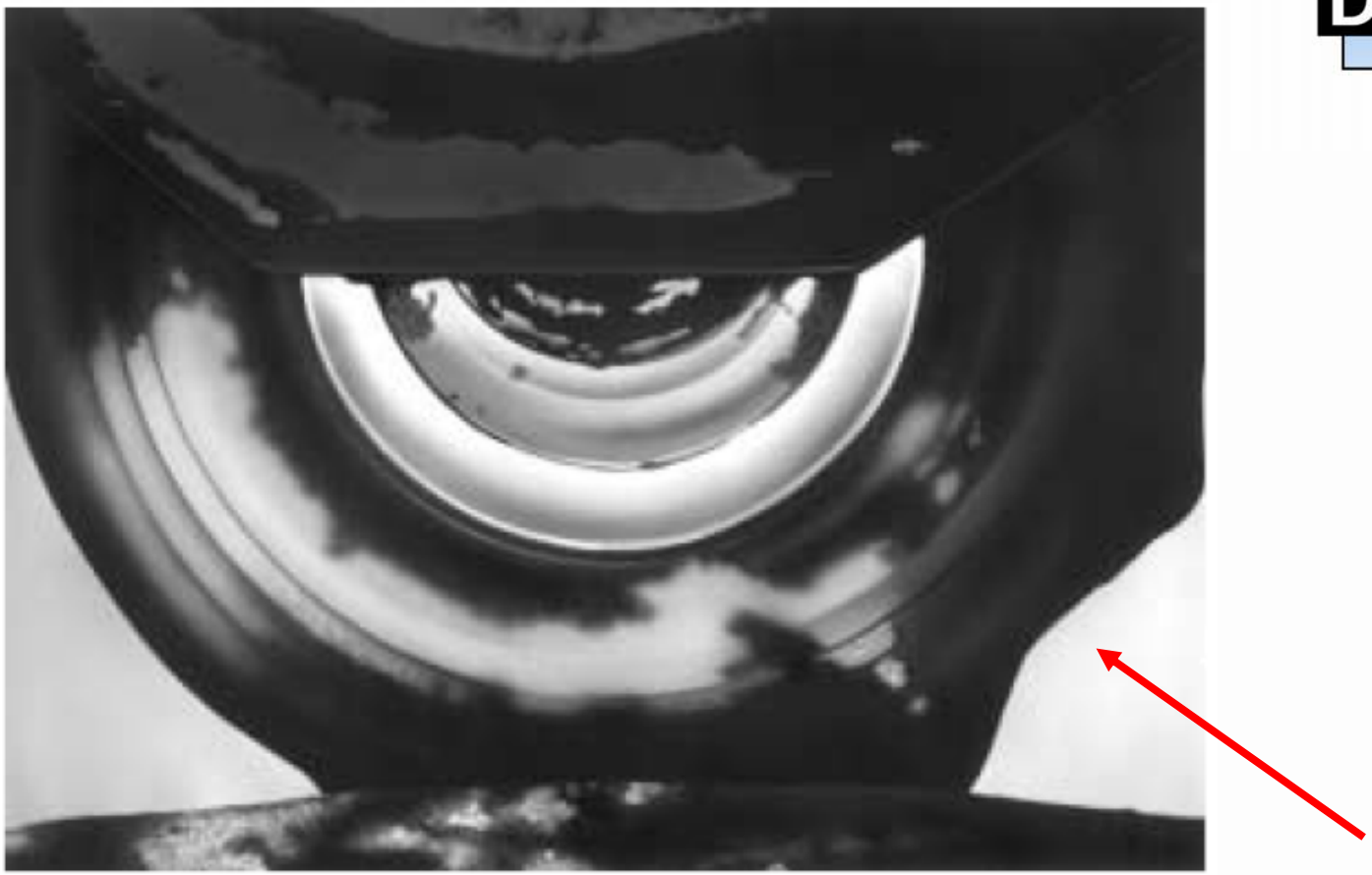
Tire Deflection

- Tire contact area is flat
- Attempts to return to normal shape
- Overshoots because of high centrifugal force
- Rebounds with overshoot
- Sets up “traction wave” in tread surface
- Deflection sometimes extreme, varies
  - Load
  - Speed

Tire Deflection



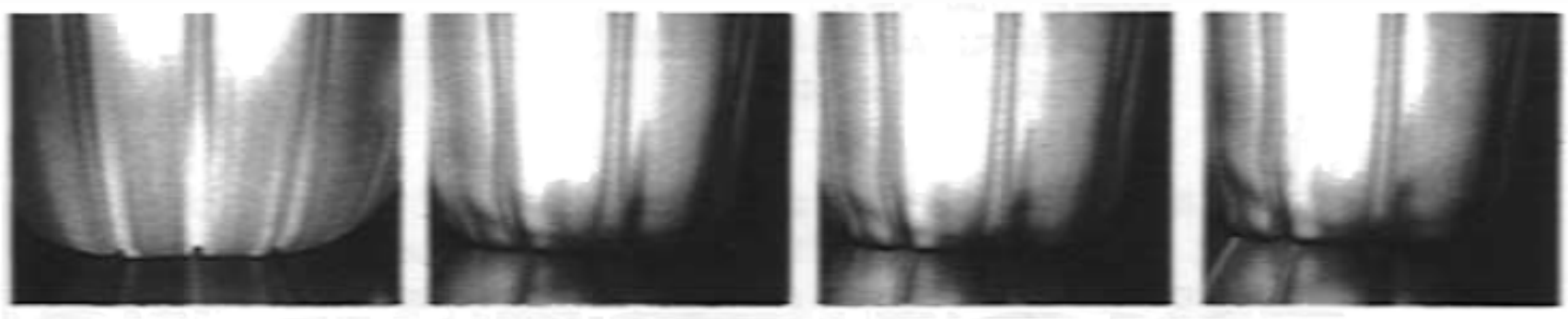
Tire Wear



250 mph 4200 rpm 1.9” deflection

Tire Wear

TRACTION WAVE vs. UNDERINFLATION



Proper -10 psi -15 psi -20 psi

Tire Wear

- **Flexing causes excess heat to build**
  - **Weakens material**
  - **Leads to tread separation**
- **Flexing increases with speed and weight**

Braking and Cornering

- Wear increases with braking
- Anti-Skid most effective at 30% skid
  - Leaves rubber tire tracks
  - Can see antiskid releases
- Where do we see the most rubber?
  - Touchdown zone
  - High speed/sharp cornering
- Runway surface plays major role

Tire Wear

New Brushed Concrete

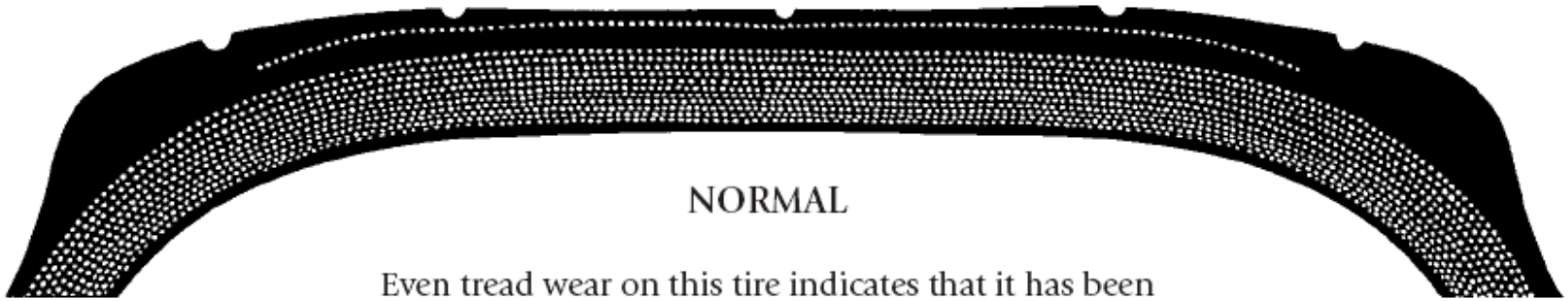
Tire Wear

Deteriorated Concrete

Tire Wear

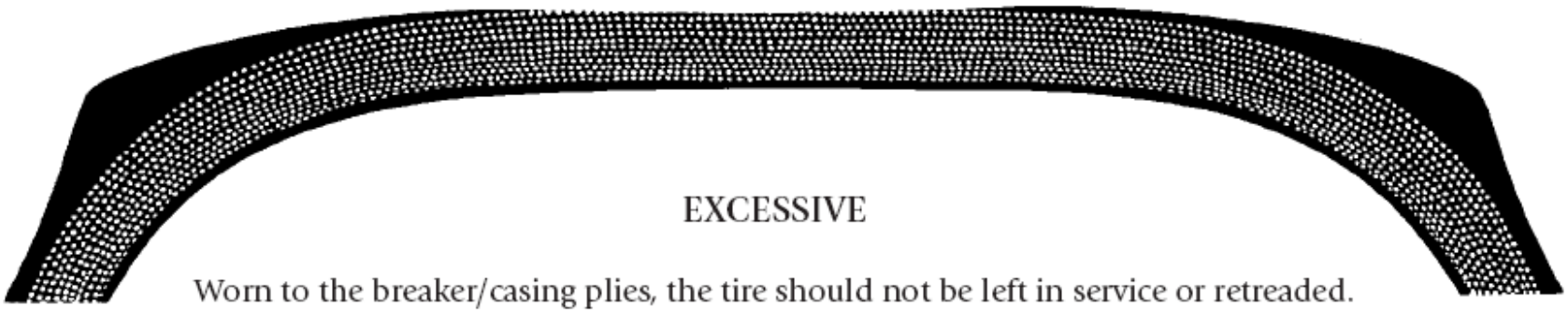
Grooved Concrete

Tire Wear



NORMAL

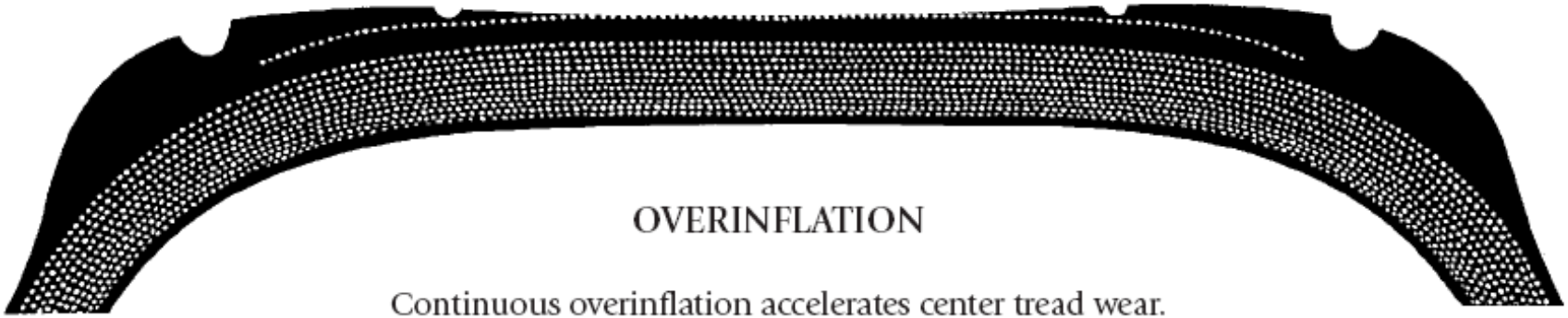
Even tread wear on this tire indicates that it has been properly maintained and run at correct inflation pressure.



EXCESSIVE

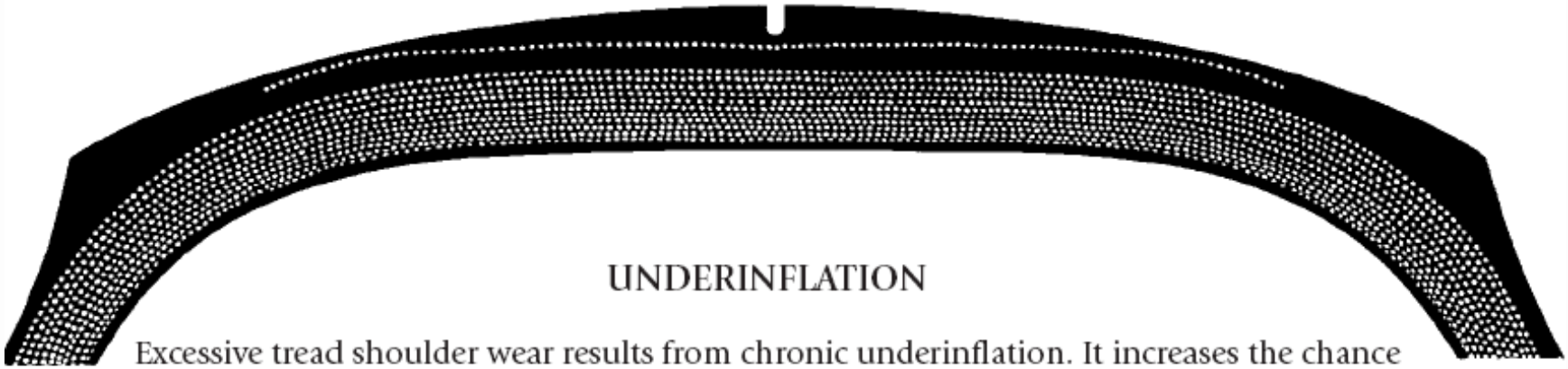
Worn to the breaker/casing plies, the tire should not be left in service or retreaded.

Tire Wear



OVERINFLATION

Continuous overinflation accelerates center tread wear.
It reduces traction while making tread more susceptible to cutting.



UNDERINFLATION

Excessive tread shoulder wear results from chronic underinflation. It increases the chance of damaging shoulders and sidewalls which shortens tire life because of excessive flex heating.

Tire Wear

- Correct inflation pressure is most important
- Check daily with an accurate gauge
  - Normal to lose 5% in 24 hrs
    - Sidewalls are vented to prevent blisters/separation
  - Visual inflation check inadequate
    - Paired wheels share load
    - Flat spot on bottom
- Inaccurate gauges are a major source of improper inflation pressure
- Check when cool
- Never bleed off excess pressure from hot tires

Tire Damage

Cuts

FOD

Tire Damage

Tread Chunking

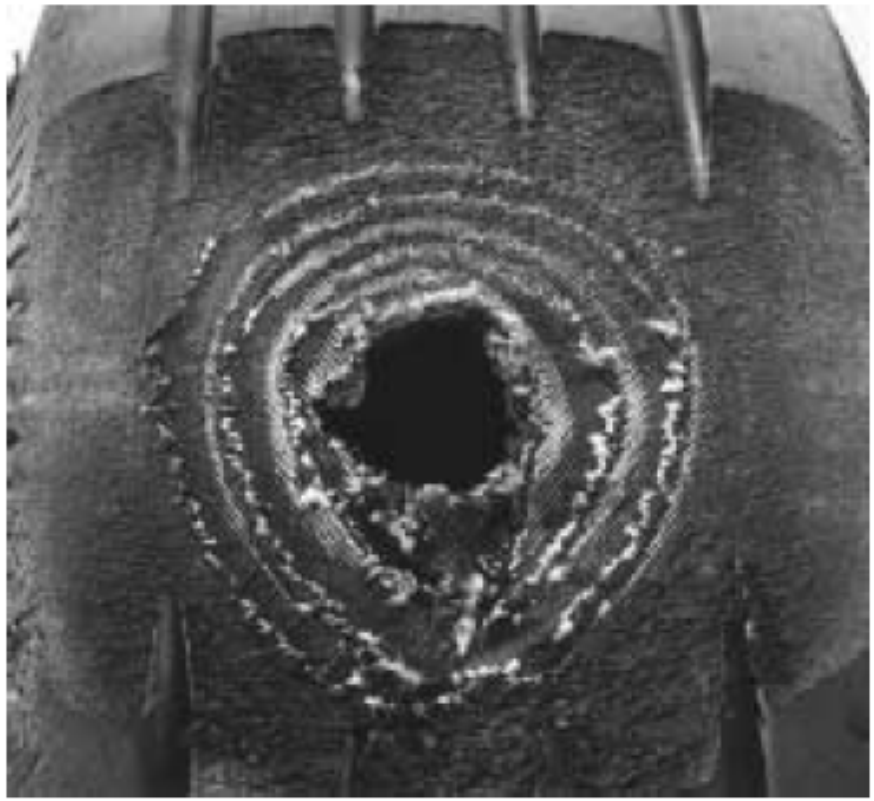
Rough or Unimproved Runway

Tire Damage

Tread Separation

Excessive Loads, Flex Heating, Under Inflation

Tire Damage



Flat Spot

Locked Wheel/Anti Skid Fault

Tire Damage

Rubber Reversion

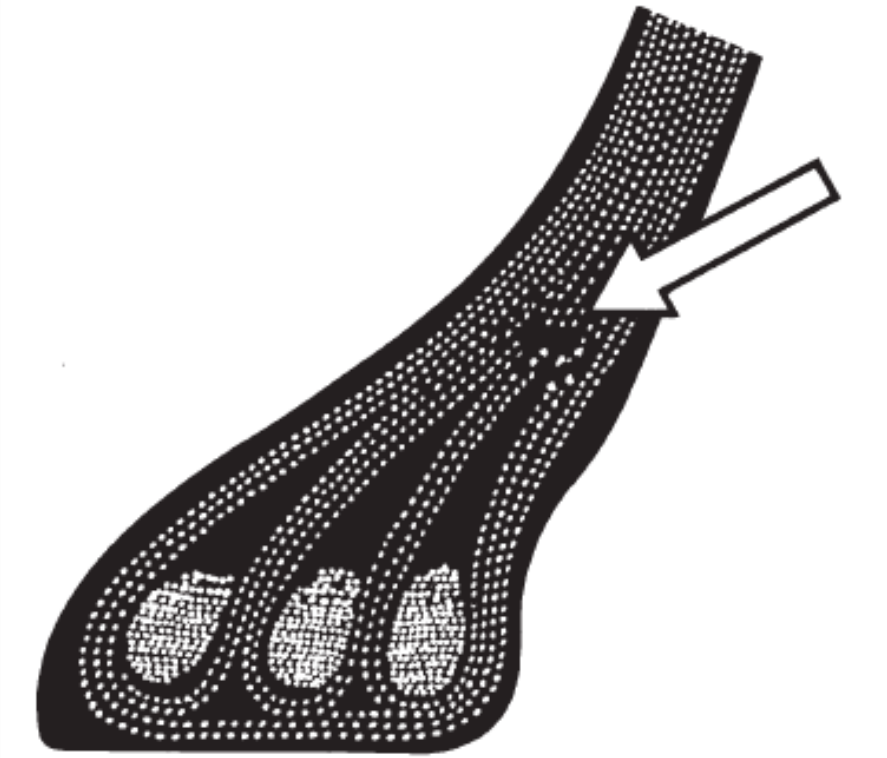
Hydroplaning

Tire Damage

Chevron Cutting

Grooved Runway

Tire Damage



Lower Sidewall Compression Break

Underinflation or Overloading

Tire Damage

- **Primary causes of damage**
  - **Low inflation pressure**
  - **FOD**
- **Most FOD from hangar floor and ramp**
  - **Good housekeeping**
  - **FOD sweeps**
- **Secondary causes**
  - **Contaminants**
  - **Ozone**

Tire Care

- Tires no less important than engines
- Tire failure potentially catastrophic
  - FOD engine or aircraft system
  - Reduced RTO braking
- Two simple steps for safety
  - Proper inflation
  - Good housekeeping

Tire Wear

Questions