

The JETS Challenge

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Challenge 2 – The Challenge of the Burning Rubber

Problem:

When a jet lands at the airport, it “burns rubber” until the tread on the wheels is in full contact with the runway and the wheels are spinning as fast as the jet is moving – normally about 20% of the aircraft’s length. A Boeing 767 is (150 ft) long and the wheels are 30 inches in diameter. The landing speed of this jet is (200 mph). Assume the jet has 6 landings per day, 7 days per week. While “burning rubber”, the wheel tread loses rubber at an average rate equivalent to a losing a tread thickness of 0.0005 inches for each tire revolution equal to rolling the entire “burn” length. Assume the tires were replaced last night (March 11, 2004) at a cost per tire of \$2000, and today is the first day of service on the new tires.

On what date will the 1-inch of tread allowance have been scraped off the tires?

Solution:

On what date will the 1-inch of tread allowance have been scraped off the tires?
20% of 150 ft of length = $0.2(150) = 30$ ft of burn.

rotations of 1 tire in 30ft.

1 rotation = 1 circumference. = $\pi d = \pi \times 30$ inches = $\pi 30$ inches

rotations per landing

$$\frac{30 \text{ ft} \times 12 \text{ in/ft}}{\pi 30 \text{ in}} = \frac{12}{\pi} = 3.81971863421 \text{ rotations/landing}$$

Thickness lost per runway = $3.8197 \text{ rotations/landing} \times 0.0005 \text{ in/rotation} = 0.001909859317 \text{ inches/landing}$

Thickness lost per day = $0.0019 \text{ inches/landing} \times 6 \text{ landings/day} = 0.011459155903 \text{ inches/day}$

of days to tread wears off

1 in
 $0.011459 = 87.2664625997 \text{ days/inch of tread (replace on the 88}^{\text{th}} \text{ day)}$

March 12-31 = 20 days

April 1-30 = 30 days

May 1-31 = 31 days

June 1-7 = 7 days

June 7 is when the tread will have scraped off the tires.