Aircraft tires performance

Engineering

a. Wheel Loading. The load on each landing gear (Tire) is calculated and there should be a state of equilibrium for moments on both sides of CG.

b. Tire Loading. If the load on tires are not equally distributed then it may cause failure. Similarly, diameter, thread, design, wear, inflation pressure contributes toward the load distribution and maybe the reason for the accident.

c. Aircraft Wheel Construction. Aircraft wheels are made from the magnesium, steel alloy or aluminum alloy, which are designed to work under high stress. The wheels are made in two halves which need to be matched by the manufacturer and part number.

d. Aircraft Tire Construction. Aircraft tires are tubeless tires designed to withstand high speed along with static and dynamic loading. Unlike automobile aircraft tires fail under continuous operation.

e. Tire Specification The specification details are mentioned on the sidewalls of tires and available in the manufacturer’s datasheets. These include ply rating, load rating, speed rating, retread history, etc.

f. Tire Inflation. Improper tire inflation is detrimental to the performance and life of the tire. Excessive wear and tear occur in case of improper inflation resulting in premature failure of tires.

g. Inflation Gas. Dry nitrogen is used as an inflation gas for aircraft tires.

h. Tire Failure Investigation. Tires failure is a dangerous phenomenon in which it can be shred into pieces and thrown with force against the body of aircraft.

i. Tire Failure Patterns

(1) Physical Damage. Examine the tire for any visible excessive wear and tear.

(2) Thrown Tread. Check for thrown tread like automobile tires and seek expert advice.

(3) Over Heat. Malfunctioning of brakes causes overheating. Melting and blistering of tires will be visible.

(4) Underinflation Damage. Deterioration, distortion, and wrinkling occur due to Under inflation j. Runway Evidence. The runway should be examined thoroughly for all mark while investigating accidents. The marks on the runway are vital for analysis purposes.

k. Hydroplaning. Dynamic, viscous and reverted rubbers are types of hydroplaning. There is no evidence of dynamic and viscous hydroplaning. In reverted rubber, there is a clean spot on the runway.

l. Skid Mark Analysis. The analysis helps in investigating the landing accidents. The skid marks pattern on the runway helps in understanding the movements.

The formula used assuming uniform acceleration is S= V2/2a

3. A thorough investigation procedure needs to be adopted after analyzing the fact and figures about tires and related landing/take off aspects for determining the reasons.