

TECHNOLOGY SOLUTION

Sensors



Smart Skin for Composite Aircraft

For lightning strike protection and damage sensing on aircraft

NASA's Langley Research Center has developed a sensor technology for structural health monitoring on composite aircraft surfaces. When conventional aircraft are struck by lightning, the result can range from no damage to serious damage that requires extensive repairs that can take the airplane out of service for an extended period of time.

The SansEC technology is a proven wireless sensing platform capable of measuring the electrical impedance of physical matter in proximity to the sensor based on a change in its resonance response. The sensor also exhibits a unique characteristic to disperse the lightning strike current to help mitigate lightning damage. In this application, an array of SansEC sensors will cover a selective area of the aircraft surface providing both mitigation and damage sensing.

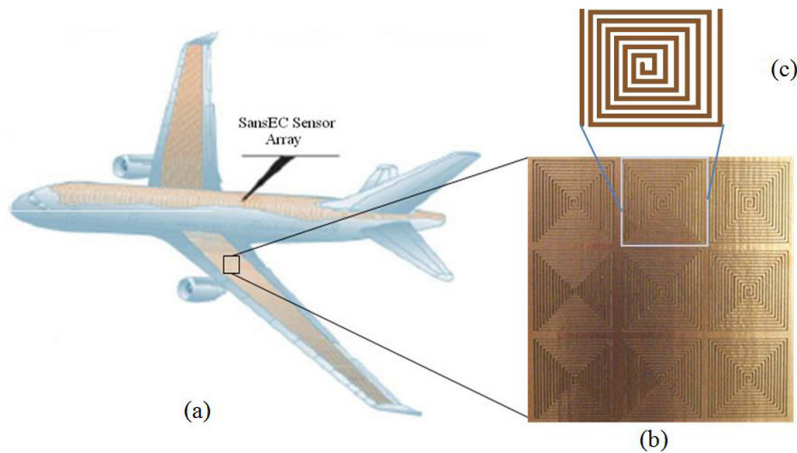
BENEFITS

- Deflects incoming lightning strikes
- Senses damage to itself or to the composite panel near it
- Damaged sensors remain fully operable, just with shifted frequency
- Sensing is accomplished without any electrical or physical contact with the coil using a radio frequency transponder
- Can be retrofitted to existing airplanes
- Scalable and mass producible



THE TECHNOLOGY

When a lightning leader propagates through the atmosphere in the vicinity of an aircraft, the lightning electromagnetic emissions generated from the moving electrical charge will radiate the aircraft surface before the actual strike to the aircraft can occur. As the lightning leader propagates closer to the aircraft, the radiated emissions at the aircraft will grow stronger. By design, the frequency bandwidth of the lightning radiated is in the range for SansEC resonance. Hence the SansEC coil will be passively powered by the external oscillating magnetic field of the lightning radiated emission. The coil will resonate and generate its own oscillating magnetic and electric fields. These fields generate so-called Lorentz forces that influence the direction and momentum of the lightning attachment and thereby deflect/spread where the strike entry and exit points/damage occurs on the aircraft.



The SansEC sensor can be applied to an aircraft and utilized as a smart skin

APPLICATIONS

The technology has several potential applications:

- Lightning protection
- Damage detection

PUBLICATIONS

Patent No: 10,193,228; 9,708,075