AIRPLANES & LIGHTNING STRIKES!©

by: Dan Pemble, McDonnell Douglas/Boeing Field Service Representative – Retired September 9, 2009

All experienced pilots have been confronted with some unavoidable weather-related events! However, because all of today's high-tech commercial airliners have sophisticated & highly accurate weather radar systems, pilots will use information provided by this system to circumvent severe weather – whenever it is possible.

Statistics show that on-average, every individual commercial airliner flying today will experience at least one lightning strike every year! Many of these strikes occur to the nose radome. A weather radar antenna is installed in the nose of all of today's commercial airliners and it is protected from the elements by the nose radome. The conical-shaped nose radome is made of a radio frequency-transparent, non-conductive material, typically fiberglass, and it is extremely vulnerable to lightning strike damage. The radome construction is made of an electrically-non-conductive material to afford the greatest "transmissivity" of signals to and from the weather radar antenna, without interference.

To protect the radome from damage in the event of a direct-hit lightning strike, there are metallic electrically-conductive "lightning diverter strips" attached to the radome. The lightning diverter strips are evenly spaced around the circumference of the radome's exterior. The aft end of each individual diverter strip is electrically-bonded to a metal ring at the inner aft circumference of the radome; in turn, the metal ring is electrically-bonded to the radome hinges that connect to the aircraft; in fact, all of the aircraft's external skin, frames, and metallic parts (aluminum, steel, etc.) are electrically-bonded together.


Typical Radome Lightning Diverter Strips

The lightning diverter strips are able to guide high-energy lightning strikes via the electrically-bonded, continuous-conductive path through the length of the airplane's external structure. The electrical path may end at numerous "static wicks" that are usually installed on the trailing edges of the wings, flaps, aileron, elevator, rudder, and tail cone. The static wicks have a non-metallic outer covering and an inner electrically-conductive "stem" that is electrically-bonded to the airplane structure. The static wicks main function is to allow static electricity buildups on the exterior of the aircraft to bleed off. However, due to the energy of lightning strikes exiting the aircraft structure via the static wicks, in many cases when an airplane takes a lightning hit, some wicks may be completely "blown off" the structure to which they were attached. In other cases, lightning strikes may actually exit the aircraft at different areas of the structure. A lightning strike typically will hit the nose or wing tip and its electricity will then travel through the plane's exterior skin and leave on the opposite end. This allows the plane to take the lightning strike, without affecting the interior or its occupants and equipment at all, and with minimal damage to the structure. During the certification process for all commercial airliners, tests are required to demonstrate the airplane's structure and systems' immunity to lightning strike damage.

Passengers will normally be totally unaware that their airplane has actually taken a lightning strike. It's just a flash of light, although it may be downright terrifying if it is noticed! Occasionally, the cabin lights may flicker for a split second.

Following a pilot report that an airplane has taken a lightning strike, maintenance personnel will do a detailed inspection of the airplane's exterior structure to determine what, if any, damage has occurred. The damage may be missing static wicks, electrical "arc traces" or "splatter" in rivets or exterior skin or damage to other exterior components. Any damage that exceeds established limits must be repaired before further flight; usually such damage is minimal and not a significant detriment to airworthiness.