



LIGHTNING SUSCEPTIBILITY ANALYSIS

BACKGROUND

Lightning strikes are a normal occurrence, but they can be potentially devastating, especially when impacting an aircraft or other combat system in operation. The SURVICE Engineering Company has more than two decades of experience and capability in the analysis and testing of lightning effects on fixed- and rotary-wing aircraft, as well as ground vehicles and other military equipment. Our extensive experience and customized tools provide our customers with the ability to model a system and determine potential areas of susceptibility to lightning strikes. Thus, we are helping to ensure that these systems remain safe, survivable, and effective throughout their life cycles.

LESAT

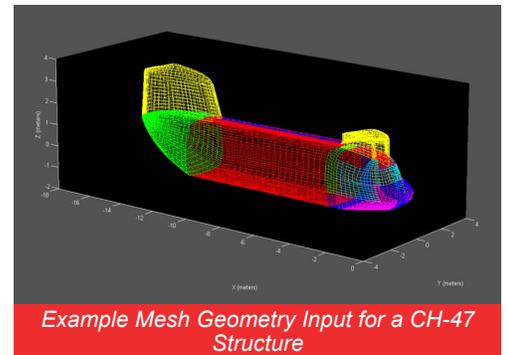
SURVICE has developed an innovative analysis tool, named the Lightning Effects and Structure Analysis Tool (LESAT), to assist designers and analysts in evaluating and protecting aircraft against the indirect effects of lightning strikes. As a cost-saving alternative to aircraft-level testing, LESAT uses MATLAB to analytically simulate/predict actual transient current levels on aircraft wiring and structural elements.



Lightning Effects Structure Analysis Tool



Lightning Strikes Behind a B1-B Lancer



Example Mesh Geometry Input for a CH-47 Structure

LESAT METHODOLOGY

LESAT allows the designer to input system geometry into a CAD format and assign electrical characteristics to the airframe. A series of mesh files is used to represent skins, pylons, and other routed cabling and electrical equipment inside the aircraft. The airframe is then converted to magnetically interacting electrical circuit elements. The equivalent circuit for an airframe becomes a network whose individual branch elements are inductors and resistors. The tool then excites the airframe with lightning attachments and computes and plots the electrical response of any electrical member of the airframe vs. time.

BENEFITS

Notable benefits of the LESAT methodology include the following:

- The tool can predict timings of voltage and current peaks.

- Lightning attachment points can be placed at any point on the physical structure and can be translated into current injection nodes in the network.
- Vehicle design and modifications can be modeled and evaluated (based on the potential structural impact) to determine the existence of flaws as the result of a lightning strike. Subsequent design updates can then be accomplished with minimal cost.
- The methodology can be used to model an unlimited number of variations of construction practices and lightning attachment tests.
- A single low-level test may be used to calibrate calculated results.
- Assessments can be conducted (in near real time) as part of the vehicle design process, thus giving designers and aerodynamicists a fast and efficient tool to assist in developing a structure that can tolerate a lightning strike.