

## NTS Facility Spotlight: Pittsfield, MA

### Specialists in Lightning Testing and Protection Services



**Our 2.4 Megavolt generator, the most modern in the U.S., is the center-piece of our Pittsfield, MA laboratory.**



**Lightning Technologies offers consultation, testing, and educational seminars on lightning protection of wind turbines.**

#### About NTS Pittsfield

The NTS Pittsfield, MA location, formerly Lightning Technologies, is home to one of the most complete lightning-simulation laboratories in the world and ranks as an international leader in the development of sophisticated lightning protection systems for customers in the aerospace industry as well as for industrial complexes, golf courses, wind turbine farms, theme parks and other high-risk locations.

#### Lightning Testing and Protection

NTS engineers and technicians are recognized experts in the field of lightning protection. The electrical characteristics of the different types of lightning flashes, and the resulting surges and fields from a strike, are complex. Engineers have found that to study the effects of lightning upon a structure or system, it is most efficient to isolate the components of the lightning waveforms and electrical/magnetic fields and to evaluate their effects through individual simulations. Our lab includes specialized and unique equipment to simulate all the electrical characteristics of natural lightning as well as the transients it induces in electrical and electronic systems.

#### Direct Effects

The direct effects of lightning include the physical damage due to the attachment of the very hot (20,000°C) and high current (250,000+ amperes) lightning channel. These effects include the burning and shattering of materials and the direct conduction of lightning voltages into electrical and electronic circuits resulting in burnouts of equipment. Two basic types of generators are used for direct effects testing: High voltage, Marx-type impulse generators produce voltages and electric fields up to 2.4 million volts to simulate lightning leader attachment and surges induced on power transmission lines. The high current generators produce up to 250,000 amperes and include three units adapted to duplicate the lightning stroke, and intermediate and continuing current waveforms of a typical lightning strike. To accommodate very large test specimens, direct effects tests are performed in facilities like Lightning Technologies' indoor high-bay laboratory that measures 80 x 100 feet.

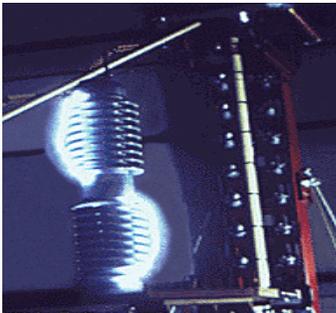
#### Indirect Effects

The indirect effects of lightning are caused primarily by earth-voltage rises that occur when the flash dumps charge into the earth and by the intense electromagnetic field associated with the flash. These fields and earth-voltage rises have enough energy to cause component damage up to a kilometer or more from the actual strike. Indirect effects are most commonly induced into system interconnecting cables and may damage or upset electronic components. The staff of LTI and NTS have been at the forefront of indirect effects test method development for many years. These methods are defined in IEEE, ANSI, SAE, EUROCAE, US MIL-STDs and many industry and company standards and specifications. The indirect effects testing lab includes many specialized devices for complete field and transient analysis, from the level of individual circuits to completely operational interconnected systems. Typical indirect effects tests include pin injection, transformer injection, capacitive injection, ground-circuit injection and field immersion techniques.

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High Voltage Laboratory



High Voltage Withstand Test  
of Insulators

### Multiple Stroke and Multiple Burst

The flickering seen in a lightning strike to ground actually is caused by a series of current strokes, the electrical characteristics of which are called multiple stroke. On the other hand, inter- and intracloud lightning has very different electrical characteristics, referred to as multiple burst. International lightning test requirements define the waveforms of both multiple stroke and multiple burst, and require that aerospace electronic systems that perform critical or essential functions be tested against the effects of both types of lightning. We have the most versatile facility for both multiple stroke and multiple burst testing.

### Field Testing

We regularly perform a wide variety of indirect effects verification testing at customers' facilities around the world.

### Static Electricity

We perform many types of static electricity tests. These procedures simulate the range of static effects: from those occurring on aircraft that can exceed 100,000 volts to the small, but potentially hazardous voltages, produced by manufacturing and material handling operations.

### Lightning Protection Courses

We have prepared a series of in depth courses to assist engineers and technicians in designing effective lightning protection for facilities, aircraft, and avionics.

- ▶ Lightning Protection of Aircraft
- ▶ Lightning Protection of Avionics
- ▶ Lightning Protection of Wind Turbines

### Highlights and Primary Test Specifications

- ▶ Design and analysis of systems and subsystems to determine the optimum protection.
- ▶ Design and testing of systems and subsystems against international standards for lightning protection.
- ▶ Consultation on lightning protection design projects as well as for lightning related problem solving, incident, accident investigations and analysis.
- ▶ In-house seminars on lightning protection, design of protection systems and testing.
- ▶ Clients have included Walt Disney World's Epcot, Typhoon Lagoon and Animal Kingdom, GE, Hamilton Sundstrand, FAA and NASA's Kennedy Space Center.

### About NTS

National Technical Systems (NTS) provides test, inspection and certification services to help clients build better, stronger, safer, more reliable products and bring those products to market quickly and efficiently. Over the last 50 years, through a combination of acquisitions, innovations and organic growth we have grown to become one of the largest commercial test laboratory networks in North America. Our capabilities span a very wide spectrum, covering environmental, dynamics, EMC, wireless, product safety, materials, ballistics and more. NTS engineers and technicians have extensive knowledge of current test and conformity requirements, both domestic and international over a range of industries including aerospace, defense, telecom and energy.



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