



## EMC Test and Environmental Stress Testing Consulting, Certification, Program Management

### Automotive EMC Testing

Elite Electronic Engineering is the leading independent automotive EMC lab in North America, providing testing and consulting services to auto, truck, and off-road vehicle manufacturers.



#### Elite's Unique Automotive Capabilities

- EMC and Environmental Stress under one roof. Elite's one location for full DV and PV testing offers convenience and saves time and cost.
- Six CISPR 25 compliant RF anechoic chambers
- 600V/m radiated immunity absorber lined or reverberation chamber
- Radiated Susceptibility to 200V/m from 10kHz – 18GHz
- Local and remote open field sites for CISPR12 and J551-2
- Satellite Radio test tone generators required for immunity testing on automotive stereo systems.

**Domestic Automotive EMC Testing-** Detroit OEMs require test results from an approved 3rd Party EMC test laboratory. Elite is an ISO 17025 accredited laboratory for automotive tests and approved lab for all test methods for the three main North American OEMs.

- Chrysler Approved
- GM Approved
- Ford Approved

#### International Automotive EMC Testing

- Honda, Toyota, Nissan, Hyundai, Mitsubishi, Mazda, Kia
- JASO transient test fixtures and waveform generators
- BMW, Volvo, Daimler-Benz, Fiat

Many of the auto manufacturers in Asia have developed EMC and electrical test specifications tailored to their test approach. Often these methods require special test equipment and procedures that are unique to the manufacturer. Elite has developed the specialized systems and methods to conduct these tests.

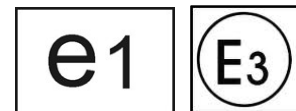
European auto manufacturers have traditionally followed the ISO and CISPR test specifications. Elite has equipment and facilities in place to test to these methods. In fact, most of the European test methods will be the same as those currently on Elite's AEMCLAP scope of accreditation.

We have invested in the systems and capability to conduct the unique transient, radiated, and conducted immunity tests. Elite capabilities include:

- Nearby Antenna RF Immunity Test
- Radiated Noise Measuring Box
- FM/TV Band Noise Measuring Probe
- Conducted Transients and Field Decay

#### Specialty Component Testing

European Union "e-Mark", UNECE "E-mark"  
Automotive Car Stereos, Satellite receivers  
R&TTE Directive CE Mark Testing and Notified Body Services  
FCC Part 15C wireless testing and certification for radios enabled with Bluetooth and other wireless features.





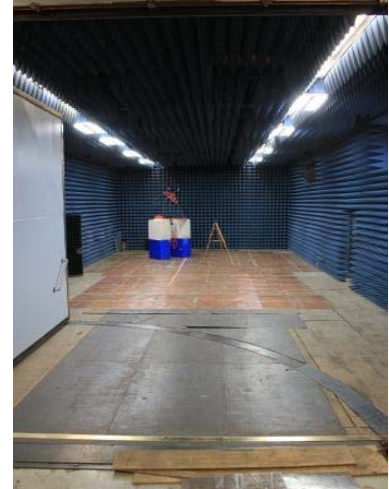
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### Truck, Ag, and Construction EMC Testing

Elite is the recognized leader for truck and heavy equipment testing for electronic subassemblies and whole vehicles. With over 20 years' experience testing vehicles and large systems, Elite can configure our facilities, testing programs and equipment in ways nobody else can.

#### Component Level Testing and Whole Vehicle Testing

- Navistar, Volvo, Paccar, Freightliner, Oshkosh
- Caterpillar, CNH, Deere, Cummins
- Military - AM General, Navistar, Oshkosh
- SAE J1455, SAEJ1113 & ISO
- European Union "e-mark" testing
- Vehicle Certification Agency (EU Notified Body) test facility.
- Whole vehicle fully absorber-lined chamber. Size 70 Ft x 35 Ft x 18 Ft



#### Truck Industry Testing

Elite is recognized by the industry leaders such as Freightliner, International, Mack, Paccar, and Volvo North America for testing electronic subassemblies and whole vehicles. Elite test equipment is capable of achieving the unique requirements for this industry including high RF susceptibility test levels and SAE J1455 load dump, mutual coupling, and inductive switching.

#### Agricultural Industry Testing

Elite supports agricultural industry testing to OEM specifications. For European Union compliance of agricultural and forestry machines and electronic subassemblies, we perform all tests specified in EN 14982. For these devices the manufacturer can self-declare compliance with the EMC directive 2004/108/EC and CE Mark the product. Similarly, for agricultural tractors Elite can complete testing in accordance with the "e" marking requirements of 2009/64/EC and 2000/2/EC.

#### Construction Industry Testing

Elite has capabilities to perform testing to the following specifications:

- Caterpillar EC-1
- Case New Holland ENS-310
- John Deere 53.3



#### EU "e"-mark and UNECE "E-mark" Test Services

In Europe, automobiles, motorcycles, trucks, buses, agricultural tractors and certain other types of road vehicles must be evaluated to confirm they will meet specified performance and safety standards. The evaluation process is called type approval

Automotive EC Directives and ECE Regulations require third party approval - testing, certification and production conformity assessment by an independent body. Each Member State is required to appoint an Approval Authority to issue the approvals and a Technical Service to carry out the testing to the Directives and Regulations. An approval issued by one Authority will be accepted in all the Member States.

VCA is the designated UK Approval Authority and Technical Service for all type approvals to automotive EC Directives and ECE Regulations. Elite is approved by VCA for testing to e-Mark (EU) and E-Mark requirements (EFTA). The process requires early notification to VCA of your product requirements. For more information on the steps necessary for complete e-Marking homologation explore VCA's website: [www.vcana.com](http://www.vcana.com).



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## FCC, Canada, and Wireless Devices

Elite provides a comprehensive range of domestic and international conformity assessment services to get your electronics and RF transceivers to market in North America, Europe, as well as in countries throughout the world.

### FCC & Industry Canada Test Services

**Expertise-** As one of the foremost providers of FCC compliance services, our staff has logged countless hours of compliance testing work and granted hundreds of RF transmitter certifications. We leverage all this expertise to provide fast, efficient, and accurate services for every one of our clients.

**Equipment** - Elite test services are performed in two (2) fully automated indoor anechoic 3-meter chambers. Our full suite of instrumentation includes multiple sets of EMI receivers, immunity test equipment, and power line surge and EFT systems.



**Highly Automated Testing** - Testing in these facilities saves time and cost, and our fully automated test equipment optimizes testing operations so results are produced quickly and accurately. Elite can complete your testing quickly and cost effectively. The low RF ambient of Elite's 3-meter chamber in combination with the fully automated control of the antenna, turntable, and analyzers allow for peak maximization and quasi-peak measurements in the fastest time.

### Credentials

**Telecommunication Certification Body (TCB) Services** - Because of Elite's authority as a FCC Telecommunication Certification Body (TCB and Industry Canada conformity body, we provide quick and confident answers to regulatory issues and sort-out complicated compliance rules and regulations.

Upon completion of testing, Elite can quickly grant the FCC equipment authorization certificate, thereby speeding entry to your marketplace. Elite can prepare all the necessary forms and electronically file applications and exhibits for FCC and Canadian certifications. In many cases, Elite can grant certifications within one day.

**ISO 17025 Accredited Testing Services** - Elite's quality credentials assure your testing is completed accurately and professionally. Elite is accredited by NVLAP and A2LA for compliance testing for North America and Europe.

*In addition, our iNARTE Certified Engineers provide the technical know-how you need to secure your regulatory approvals, and in the shortest time.*





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## CE Mark & Global Compliance Services

We have successfully tested for compliance in hundreds of CE Mark applications, and our support staff and engineering team stand ready to assure that your products will meet all the requirements of the European Union's "New Approach" Directives.

### CE Mark Services

- CE Mark Testing
- Regulatory Consulting
- Notified Body Services
- Electrical Safety Design Review
- Machine Safety Risk Assessment
- Documentation Services
- Government Agency Liaison Service



### CE Mark Expertise

**EMC Directive 89/336/EEC – 2004/108/EC** We utilize the latest instrumentation and automation to accurately and cost effectively determine a product's performance against the harmonized European standards. Having an indoor 3-meter anechoic chamber, Elite can process RF emissions and immunity testing without having to move from an indoor preliminary testing to open air test site. Plus in our whole vehicle chamber we can test large machinery, agricultural equipment, and other systems easily and cost effectively.

**R&TTE Directive 1999/5/EC** - In January 2001, Elite was designated by NIST as a U.S. Conformity Assessment Body (CAB) for the R&TTE Directive and EMC Directive. Elite can now review technical construction files as a Notified Body and issue compliance statements in accordance with the R&TTE Directive Annex IV.

CE 0978

**Low Voltage Directive 73/23/EEC- 2006/95/EC-** Inspection and survey of the test item to identify design and construction compliance. We also review schematics, instruction manuals, safety labeling and warnings. Elite will test where applicable and consult on equipment modification necessary to meet the standards. Our services take into consideration European as well as North American compliance regulations.

**Machine Safety Directive 89/392/EEC – 98/37/EEC** Elite experts will analyze and document the relevant safety issues and work with the client to resolve the safety concerns through redesign, guards, safety interlocks, or warnings.

**The Elite Global Compliance Advantage - Asia, South America, Africa, and the Middle East**  
Elite agents and subcontractors provide the link to global compliance for transmitters, receivers, and other electrical systems that require market approvals. We manage all aspects of testing, certification, documentation and renewals.





## EMC Test and Environmental Stress Testing Consulting, Certification, Program Management

### Military EMC Testing

Since 1954, Elite has been providing EMC test services for manufacturers of military electronic systems. Because of our half-century service to this industry Elite engineers bring unparalleled MIL-STD test expertise to defense related products and assure accurately and efficient services.

#### Military EMC Test Expertise

- Aircraft, Ships, Vehicles, Command & Control, Warfighter Equipment
- MIL-STD-461/462—Revisions, A through F
- DEF-STAN-59-41—U.K. Military EMC Spec
- MIL-STD-1275—Vehicle power quality
- MIL-STD-704—Aviation power quality
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#### iNARTE Certified Engineers

Trust Elite's staff of iNARTE credentialed EMC engineers to provide the highest caliber of expertise and service.

#### NVLAP Accreditation for All MIL-STD-461 Tests

Our NVLAP accreditation assures acceptance of Elite's test data in accordance with NAVAIR and military contractor directives for quality management systems of their test services providers.

#### Combined Test Services of EMC (MIL-STD 461) and Environmental Stress Testing (MIL-STD-810)

Elite clients benefit in time, cost, and convenience by concurrent EMC and environmental stress testing.

#### Test Reports and Test Plan Development

Elite technical documentation services include the development of formal test plans and test reports.

#### Military EMC Testing Equipment and Capabilities



##### HIRF Testing- High Field RS103

Elite's powerful collection of amplifiers can deliver High Intensity Radiated Field (HIRF) testing throughout the range of 10kHz to 40GHz

- 200V/m from 10kHz-40GHz
- 600V/m from 400MHz-1000MHz
- 1000V/m-1500V/m 1-18GHz (Pulsed RF) anechoic
- 2000V/m-4500V/m 1-18GHz (Pulsed RF) mode tuned

##### Electromagnetic Pulse (EMP) Testing

Elite's Electromagnetic Pulse (EMP) simulator is designed to test in accordance with MIL-STD-461 RS105 at pulse amplitudes in excess of 50,000V/m.

#### Large Test Item Services

- Configurable resistive power load banks and heat exhaust capability
- 10kW amplifier for CS116 damped oscillatory wave at 10A
- CS 114 current clamps for 2 inch bundles
- LISNs (DC-480V 3phase) up to 200 Amps



## EMC Test and Environmental Stress Testing Consulting, Certification, Program Management

### Commercial Aviation EMC Testing

Elite Electronic Engineering is a leader in providing EMC and environmental stress testing services to the commercial aviation industry. Our test and consulting engineers assist manufacturers of aircraft avionics, power generating equipment, and other flight support systems comply with rigorous governmental requirements and aircraft OEM specifications. Since Elite is highly regarded in the aviation industry, our test results and reports are readily accepted and approved by the major aircraft OEMs.



#### Commercial Aviation Test Expertise

- RTCA-DO 160 Revision F, E, D, C
- Boeing D6- 16050-4
- Elite's staff of EMC Engineers are iNARTE certified to assure the highest caliber of expertise and service.
- ISO 17025 Accreditation for RTCA DO-160 Tests
- Combined Test Services of EMC and Environmental Stress Testing provides convenience and cost savings.

#### Section 20 HIRF Testing

Elite's powerful collection of amplifiers can deliver High Intensity. Radiated Field (HIRF) testing in excess of 200V/m throughout the range of 10kHz to 40GHz, and higher levels at other ranges.

- 200V/m from 10kHz-40GHz
- 600V/m from 400MHz-1000MHz
- 1000V/m-1500V/m 1-18GHz (Pulsed RF) anechoic
- 2000V/m-4500V/m 1-18GHz (Pulsed RF) mode tuned

#### Section 22 Lightning Susceptibility

Elite has the expertise and equipment to apply DO-160 Section 22 Secondary Effects Lightning transients including single stroke (SS), multi-burst (MB), and multi-stroke (MS) pulses. Elite can apply all RTCA DO 160 waveforms at Level 5.

- Pin Injection: 3(1MHz)/4/5A/5B up to Level 5
- Cable Injection: SS & MS 1/2/3 (1&10 MHz)/4/5A/5B up to Level 5
- Cable Injection: MB 3(1&10 MHz) up to Level 5



#### Combined Test Services of EMC and Environmental Stress Testing

Completing your EMC and environmental stress testing in parallel is more convenient, efficient and cost effective.



## EMC Test and Environmental Stress Testing Consulting, Certification, Program Management

### Environmental Stress Testing

Since 1973, Elite has been providing comprehensive environmental stress testing services to complement our extensive EMC test capabilities. Having access to Elite's full suite of test services all under one roof translates into convenience, time saving, and more cost effective approach to product validation.

#### Typical Environmental Stress Testing Specifications

- MIL-STD-810, MIL-STD 202, RTCA DO-160
- SAEJ1455, GM, Ford, Chrysler, Nissan, Toyota
- IEC 68, IEC 529, NEMA
- NEBS, ASTM, ANSI

#### One-Stop Service

- Saves time and cost, while easing effort associated with test management
- Witness all testing at one site
- Single point of contact for all test services
- Test item, wiring harnesses, and support equipment are controlled at one location
- Perform multiple tests at one site to compress test program duration

#### A2LA Accredited, DSCC Approved

Elite's is an ISO 17025 accredited test laboratory through A2LA and recognized by the Defense Supply Center Columbus (DSCC) for testing QPL listed electronic components.

#### Program Management for Large Scale Test Projects

Let Elite coordinate all phases of design validation and production validation testing, from test plan development, fixtures, testing, and reporting.

#### Test Automation, Data Acquisition Services, Test Fixture Development

Elite engineers are available to develop custom automation for test control, life cycling, or data acquisition.

#### Reliability Engineering Services

Elite can perform many engineering related services to assist manufacturers relate quantitative or qualitative metrics to the reliability of their products.

- Design review
- Specification development
- Test plan development
- Failure Report & Corrective Action (FRACAS)
- Formal EMC & Environmental test reports
- Acquire field data for electrical, vibration, shock, and climatic conditions.
- Develop test plan and reliability plans around client information
- Vibration & Shock Fixturing
- Design & Build Life Cycling test and monitoring equipment
- HALT, Initial electrical and EMC tests





## EMC Test and Environmental Stress Testing Consulting, Certification, Program Management

### Environmental Stress Testing

#### Dynamics Testing

*Vibration - Mechanical Shock - Sustained Acceleration*

We have six (6) electro-dynamic vibration systems including machines capability of pushing up to 25,000 pounds of armature force.

- Random, sine, and sine on random vibration control
- Field Data Replication, Kurtosis Control
- SRS or Trapezoid Classical Wave Shapes
- Drop Mechanical Shock up to 300Gs-30msec



#### Climatics Testing

*Temperature and Humidity Cycling – Altitude – Thermal Shock - Icing*

With a versatile suite of test chambers, Elite can readily fit your products into the chamber environment that best suits your product application and test budget. Chamber capabilities range from compact economical units to walk-in chambers as well as high altitude chambers or rapid decompression.



#### Exposure Testing

- Salt Fog Exposure- Two (2) chambers
- Dust Chambers- IP enclosure protection, MIL and DO-160 blowing dust .
- Gravel Bombardment- SAE J1455, SAE J400
- Water Testing- IP or NEMA Ratings, RTCA DO-160, MIL-810, SAE 1455, ISO/IEC
- Blowing Rain, Spray, Immersion, Drip, Power washing, Steam Cleaning
- Icing and Ice Accumulation
- Fluids Contamination
- Explosive atmospheres

#### Materials Testing and Connector Testing

Tension/compression testing up to 20K pounds on various types of material including ceramics, plastics, polymers, metals and composites. High rate cyclic testing at 100Hz at 10k pounds. Tests at ambient or at thermal extremes.

#### HALT/HASS

- 6-Axis repetitive shock vibration with concurrent thermal shock
- Quasi-random vibration up to 100Grsm with 2000G peak accelerations
- -100C to +200C thermal shock

Typical tensile properties testing follow ISO 527, ASTM D638, or ASTM 790 and Elite is equipped to conduct all tests per these methods. We are equipped for these and many other unique services for materials testing. Contact the Elite sales department for more information.



#### Accelerated Life Testing

Elite engineers can design and build machines that mechanically cycle the test item and apply fatigue stress and wear stress that are representative of real life use. These fixtures can be designed for testing at ambient condition or at environmental extremes. Elite life cycling fixtures are designed to mate with thermal cycling chambers or onto vibration tables where the test item can then accumulate life cycles stresses at environmental extremes.