

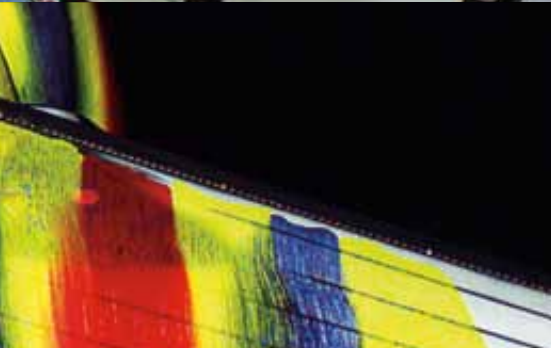


Boeing Technology Services

STATE-OF-THE-ART

TESTING FACILITIES

Your direct connection to the technical resources of The Boeing Company



Tap into the resource that is Boeing.

Your challenges in testing, evaluation, measurement, calibration, and certification are our specialty. Boeing Technology Services is your point of access to the vast laboratory resources of The Boeing Company. Your Boeing Technology Services representative will work with you to match your requirement to the appropriate facilities, equipment, and technical support.

Ft. Greely, Alaska

Maui, Hawaii

We have more than 500 testing facilities across the United States.

Boeing Technology Services contracts with companies, educational institutions, and government organizations for use of Boeing laboratory facilities throughout the United States, subject to availability and Boeing program requirements.



We work with you to identify the right facility for your requirements. Your Boeing Technology Services representative will make all the arrangements to ensure that you receive the right technologies and the right support to make your project a success.

Testing Capabilities

Aerodynamics, Noise & Propulsion

Wind tunnels

Polysonic wind tunnel (PSWT, 4 by 4 ft):

- Subsonic, transonic, supersonic
- Supersonic inlet testing
- Inlet diffuser testing

Transonic wind tunnel (BTWT, 8 by 12 ft)

Nozzle test facility (BNTF)

Subsonic wind tunnel (BWWT, 20 by 20 ft)

Low-speed aero-acoustic facility (LSAF):

- 9- by 12-ft contraction, without insert
- 7- by 10-ft contraction, with insert

Icing tunnel (BRAIT, 4 by 6 ft)

Test Chambers

Acoustic facilities:

- Interior noise test facility
- Quiet air facility
- Reverberant and anechoic environments

Fuel properties

Fire and hazardous testing

Fuel systems and components testing

Mobile Test Services

Airplane interior noise measurement

FAA noise certification

Airport ramp noise measurement

Phased array microphone systems

Fire extinguishing system certification

Other Test Services

Experimental hardware design and fabrication (including wind tunnel models)

Flow visualization

Flow field surveys

Pressure-sensitive paint technology

Environmental Test

Dynamic and static environments

Space thermal vacuum simulation

- Vibration, shock, sonic
- 30- by 40-ft chambers
- 30- by 30-ft chambers
- 30- by 19-ft chamber
- 8- by 16-ft chamber
- 8- by 8-ft chamber
- Small chambers

Centrifuge laboratory

Thermal cycling

• Ambient and vacuum

Fluid dynamics

Earth environments

Applied Simulation Engineering (ASE)

Flight simulation laboratories

Simulation development environment

Hardware-in-the-loop simulation

• 200-microsecond frame time

Aircraft simulations and flight visualization

Electromagnetics

Antenna ranges

Radiation pattern measurement

Antenna impedance

Phased array antenna impedance

IR and visual signature prediction

and analysis

HIRF testing

TEMPEST testing

EMP signal injection/free field testing

Direct and indirect lightning testing

capabilities

RCS

RF and IR material properties

Electromagnetic compatibility (EMC) chambers

Electromagnetic interference (EMI) testing

Electromagnetic effects (EME) shield rooms

Structures

Materials testing

Component testing

Full-scale static and fatigue structural testing

Instrumentation and controls

Structural modal analysis

Environmental vibration testing

Full-scale aircraft drop testing

Flight vehicle ground vibration testing

Pressure and thermal capabilities

Materials and Processes

Materials and physics

Finishes and sealants

Composites and bonding

Rapid prototyping

• Selective laser sintering

• Stereo lithography

Ceramics

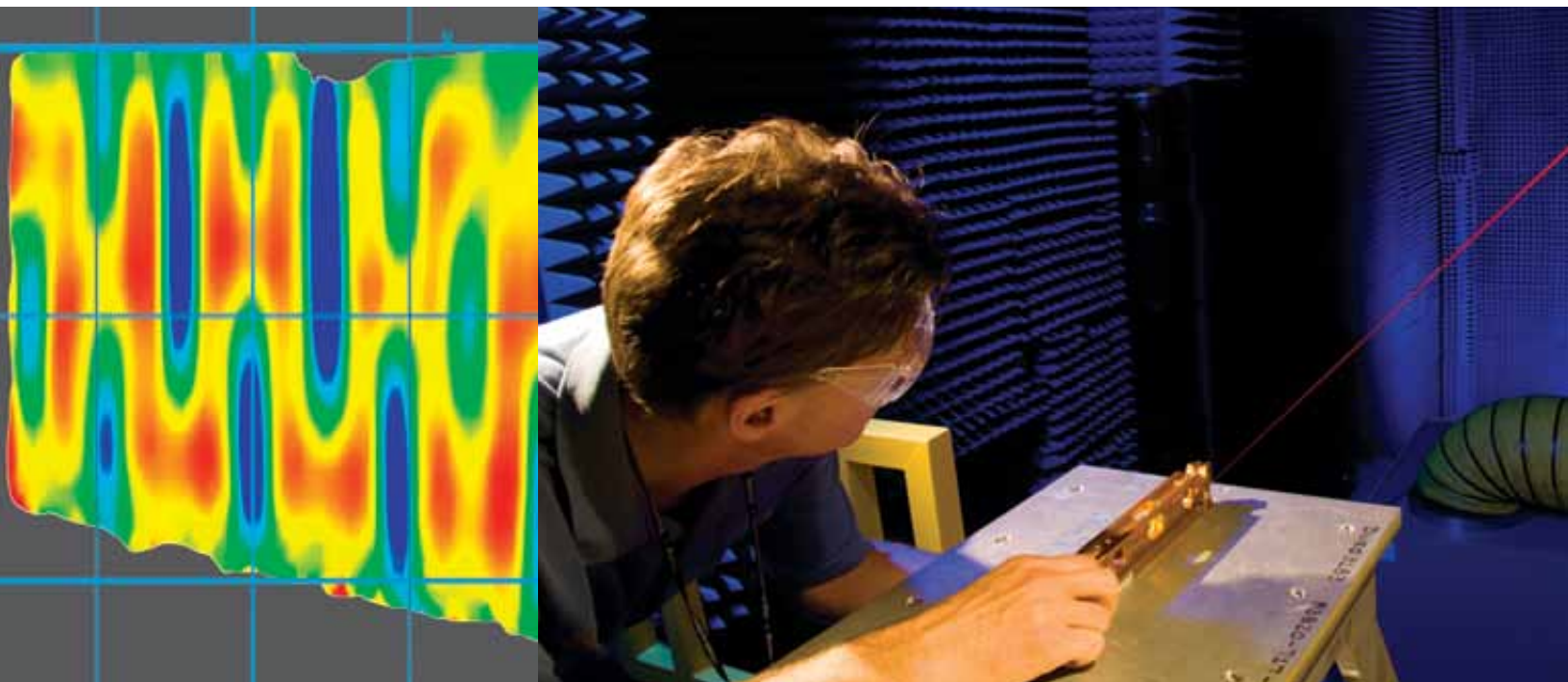
Failure analysis

Nondestructive testing

Metallurgy, flammability

CT scanning

Researchers from fields as varied as archeology and sports equipment design have used Boeing laboratories and expertise to achieve breakthrough results.



Aerodynamics, Noise & Propulsion

For the highest confidence in your test results, Boeing Aerodynamics, Noise & Propulsion facilities accommodate a wide variety of test articles, including full-scale components and products, as well as scale models. Our specialized laboratories include wind tunnel, noise test, nozzle test, and fuel- and fire-systems test facilities. Our multi-disciplinary technical personnel can bring the test capability to you for on-site measurements and field testing.

We provide end-to-end, full-service test capabilities and can help you design your testing program—from choosing the right facility and equipment to developing test procedures, collecting data, and analyzing results.

Electromagnetics

Our facilities are equipped and staffed to test electromagnetic environmental effects, antenna patterns and parameters, radio-frequency scattering and cross section, electromagnetic behavior of materials, and electro-optic and laser systems. With both indoor and outdoor facilities—including the

world's largest indoor antenna and radio-frequency scattering range—we work with you to match test protocol and environment to your test item, large or small. Our electromagnetic interference test facilities support both military and commercial standards.

The lightning test laboratory can test full-size components and installed systems. Material measurement laboratories facilitate development, characterization, and evaluation of specialized materials and radomes. Radio-frequency, electro-optics, and infrared signature laboratories are colocated to help you manage cycle times and costs for a broad spectrum of tests.



The world's largest indoor antenna and radio-frequency scattering range accommodates large aircraft components and systems, the widest variety of mounting systems, and the broadest frequency coverage.

Boeing laboratories serve researchers and developers the world over in a variety of fields.

Environmental Test

Product developers from a wide variety of fields have come to trust Boeing Environmental Test to care for their valuable test articles in harsh and potentially damaging test environments. Our technical staff continuously monitors and controls testing that can range in duration from milliseconds to months at a time.

Environmental Test laboratories play a crucial role ensuring that the satellites relaying essential information, the airliners that carry us around the globe, and the military aircraft vital to defense are equal to the challenges of harsh operating conditions, including thermal extremes, vacuum, solar radiation, rain, humidity, vibration, acoustic noise, and shock.

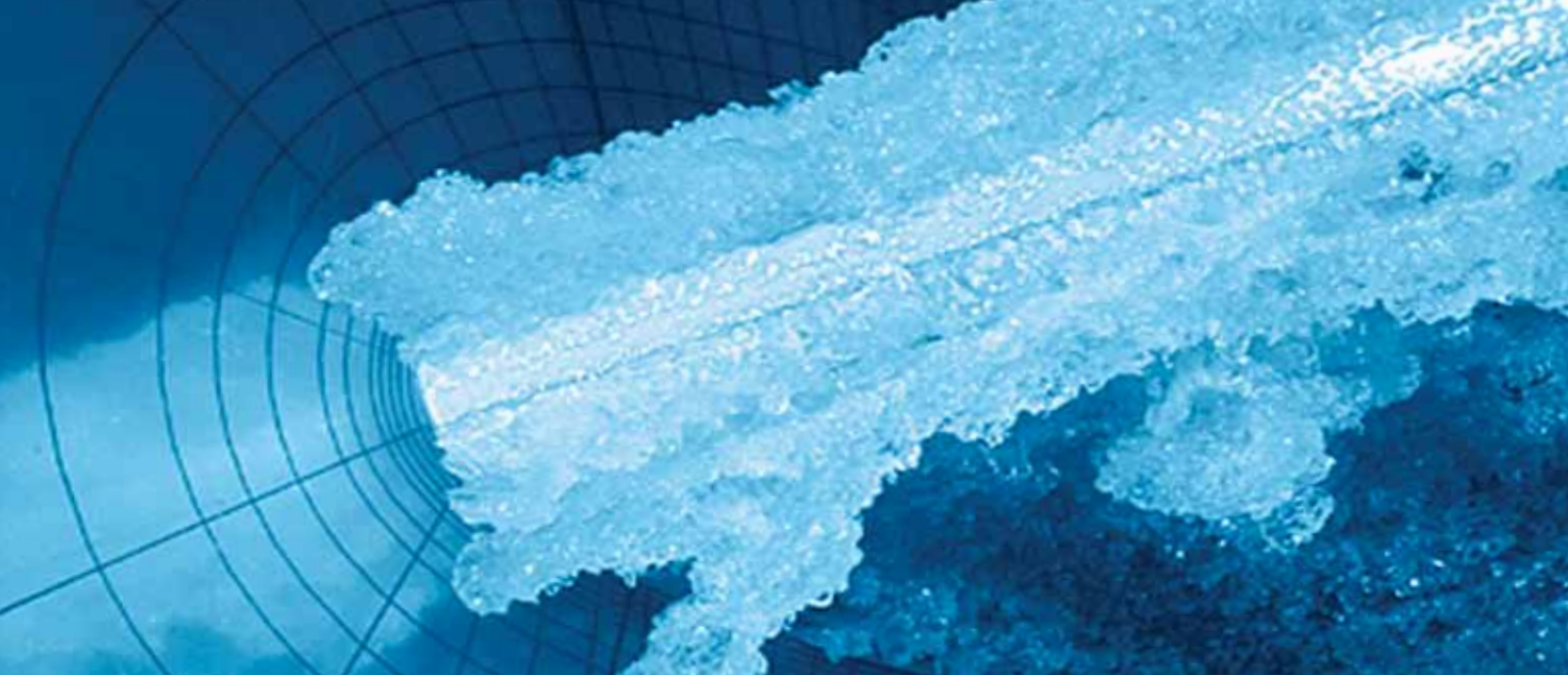
Our specialists are available to review your requirements and guide you to the test solution to best meet your needs.

Structures

Boeing structures testing capabilities include facilities for materials, components, and full-scale structural testing, with a complete complement of engineers, technicians, technologists, and administrative personnel. We provide a full spectrum of structural testing services, multiple-use structural test resources, and structural test records to support Boeing and non-Boeing products through all phases of the product life cycle.

Specialties include static and fatigue testing of structural materials, components, and full-scale articles. Focusing on safety, quality, and service, our laboratories routinely produce data that is vital to the concept development, design verification and validation, analysis, and certification of a wide variety of commercial and military systems.





Applied Simulation Engineering (ASE)

Real-time, high-fidelity engineering simulations bring systems, operators, and the operational environment together for the first time to facilitate efficient, effective product development.

We partner with you throughout the program life cycle to support product design and development, system integration, production, and user training. Rigorous testing early in the product development phase reduces risk in programs that involve large-scale systems integration. Hardware-in-the-loop and real-time operator-in-the-loop testing ensures that designs meet functional and operational requirements before fabrication of production-level hardware and integration of software systems. Modeling the system and subsystems allows evaluation of functionality, performance, and interoperability early in the design process, when changes can be incorporated cost effectively.

ASE uses a disciplined approach to achieve optimum accuracy in testing and analysis while controlling cost to the customer.

Systems Integration and Test Labs (SITL)

Our engineers, technologists, and support personnel create and manage cost-effective, low-risk test environments for dynamic simulation and hardware-in-the-loop testing. We specialize in developing integration test facilities, providing test services, and managing and maintaining laboratory equipment and operations. We can design and build new systems integration labs, deliver the lab to the programs, and maintain the lab for continued program success.

SITL facilities can link to personnel and systems in other laboratories for testing during all program phases, from initial business development and systems requirements development through system verification, validation, and product troubleshooting and anomaly investigation.

Capabilities include complex systems test on airborne, ground, sea, space, and cyberspace platforms, such as platform-centric testing, system-of-systems testing, and distributed network-centric testing, involving live, virtual, and constructive (LVC) assets.





Boeing Technology Services

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Please feel free to contact us for more information on how our labs can help you in your development.