FACILITIES
National Institute for Aviation Research (NIAR)

Since its inception in 1985, NIAR has made a name for itself as the most capable university-based aviation research center in the United States, providing research, design, testing and certification to the aviation manufacturing industry, government agencies, education entities and other clients that can benefit from our services.

With 135,000 square feet of research and office space, the institute is home to more than a dozen laboratories, including Advanced Joining and Processing, Aging Aircraft, CAD/CAM, Composites and Advanced Materials, Computational Mechanics, Crash Dynamics, Environmental Test, Full-Scale Structural Test, Mechanical Test, Nondestructive Testing and the Walter H. Beech Wind Tunnel. Other labs offer support in Calibration and Quality, Metrology, and Machining services.

Crash Dynamics Laboratory

The Crash Dynamics Lab is a premier dynamic testing facility providing research, testing and certification of aircraft and non-aviation components under dynamic impact conditions. Established in 1992 and updated in 2005, the Crash Dynamics Lab encompasses 4,500 square feet and is housed in an indoor environment in which the temperature is controlled and maintained at approximately 70°F. Temperature and Relative Humidity are monitored and recorded by an annually calibrated monitoring system.

The driving force of the lab is a MTS Model 888.20 crash simulator with an accelerator sled. Other lab equipment includes Hybrid II, Hybrid III and EuroSID II instrumented test dummies, Endevco and Entran accelerometers, DSP Technology signal conditioning and analysis system, Denton load cells, AOS S-VIT high-resolution digital color video system and 1,000 square feet of client office/work space. The lab’s capabilities are backed up by high-tech support units such as NIAR’s CAD/CAE Lab, Computational Mechanics, and Research Machine Shop.
The CDL has set aside a meeting room for the sole use of the customer. The room contains most, if not all, of what is needed to conduct business. The room contains:

- Large conference table and 6 executive-style reclining chairs
- Computer with 42” plasma monitor
- Refrigerator stocked with snacks and beverages
- Free coffee
- Scanner/copier/printer
- Wireless Internet
- Power outlets
- Whiteboard
- Speakerphone
- Microwave oven

The CDL also provides multiple work benches and laboratory space for customer usage, as well as extra space for additional test article storage during Client occupancy.

**EQUIPMENT**

**MTS Crash Simulator Model 888.20**

The MTS Model 888.20 servo-hydraulic crash simulator is an accelerator sled system capable of duplicating almost any type of crash pulse.

- **Nominal Force:** 2,000 kN (500,000 lbf)
- **Maximum Acceleration:**
  - 65 g, with 1500 kg (3300 lb) payload
  - 75 g, with 1000 kg (2200 lb) payload
- **Maximum Velocity:** 81 kph (50 mph), with 1500 kg (3300 lb) payload
- **Dynamic Response:** >150 Hz
- **Sled Dimensions:** 1.2 m x 4.0 m (48” x 156”) platform

**Seattle Safety 198KW Tungsten Lighting System**

- Two 60KW side overhead banks
- One 24KW front overhead bank
- Two additional 21KW floor units
Anthropomorphic Test Devices (ATD)

- Hybrid II 50th percentile male (Qty: 6)
- Hybrid III 50th percentile male (Qty: 2)
- FAA Hybrid III 50th percentile male (Qty: 2)
- Hybrid III 5th percentile female (Qty: 1)
- Hybrid III 95th percentile male (Qty: 1)
- CRABI 12 month old child (Qty: 1)
- Hybrid III 3 year old child (Qty: 1)
- Hybrid III 6 year old child (Qty: 1)
- EuroSID-2 (Qty: 1)
  - Optional rib extension (ES2-RE)

The Crash Dynamics Laboratory maintains and re-certifies all dummies with our own Anthropomorphic Test Device Calibration Equipment provided by First Technology Safety Systems.

AOS S-VIT Digital High Speed Cameras

- Six (6) Digital High-Speed, High Resolution, Color Imagers (Onboard/Off-board capable)
- 1000 frames/second at 800x600 pixilation
- Onboard junction box and battery
- Color correction
- Improved light sensitivity
- Onscreen display of test number, camera location, time, and frame number
- Various lens options:
  - 12.5 mm
  - 25 mm
  - 8 mm
  - 18 mm

TEMA Automotive Motion Analysis Photometric Software

- 2D and 3D trajectory plots from both left and right sides of sled
- Simplified lens correction
- Built-in perspective and parallax correction
- Polynomial spline and other filtration
- 3D tracking with relative camera orientation
- Automatic target tracking
- Virtual point tracking
Quantum Composers Model 9730 Airbag Current Pulse Generators

- 8 independent fully-programmable outputs
- 6A output per channel
- Current and voltage monitor recordable
- Time delay available in 0.1 µsec increments

Laboratory Instrumentation

The Crash Dynamics Laboratory can provide almost any instrumentation needed; including, but not limited to:

- Accelerometers (2000g)
  - Head, Chest, Pelvis
- Load Cells
  - Upper Neck, Lumbar, Femur
- Potentiometers
  - Chest displacement
  - String pots
- Seat belt load cells
- Floor, Seat Leg, Seat Track load cells (3-axis and 6-axis)
- Strain Gages - up to (30) 350 ohm and (10) 120 ohm

Data Acquisition, Processing, and Analysis

- 96 Channels, Spectral Dynamics VX2850B
  - 10,000 samples/sec/channel
- DSP Technology IMPAX-SD data collection control and processing software
- National Instruments DIAdem report generation software

FaroArm Titanium CMM

- 5 ft. reach in all directions
- Pre- and post-test deformation measurements
- ATD positioning measurements
FIXTURES

Mounting Plates

- 0° yaw plates
  - 96”L x 48”W x 1”thk. Aluminum, 3” x 3” 1/2-13 thread hole pattern (Qty. 2)
  - 110”L x 39”W x 1”thk. Aluminum, 3” x 3” 1/2-13 thread hole pattern (Qty. 2)

- 10° yaw plates
  - 96”L x 48”W x 1”thk. Aluminum, 3” x 3” 1/2-13 thread hole pattern (Qty. 2)
  - 96”L x 59”W x 1”thk. Aluminum, 3” x 3” 1/2-13 thread hole pattern (Qty. 1)
  - 96”L x 72”W x 1”thk. Aluminum, 3” x 3” 1/2-13 thread hole pattern (Qty. 1)

- 14.47° yaw plate
  - 96”L x 59”W x 1”thk. Aluminum, 3” x 3” 1/2-13 thread hole pattern (Qty. 1)

- 60° pitch fixture
  - 45.5”L x 64.4”W x 1”thk. Aluminum, 3” x 3” 1/2-13 thread hole pattern (Qty. 1)
  - Fixture lays flat during test article set-up. Once the test article is loaded, the fixture is raised and locked into the 60° pitch position.

Pitch and Roll Fixtures

- 10° Pitch (Qty. 3)
- 10° Roll (Qty. 2)
Rigid Seats

- FMVSS 213 CRS Bench
- Single rigid seat
  - Capable of measuring seat pan and seat back forces and moments
  - 5° and 10° seat pan
  - 10° and 13° seat back
- Side by side rigid seats
  - Seat belt comparison

SAMPLE TEST SETUPS

Automotive Buck

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**Simulated Bus Section**

**Aviation – 14 CFR 25.562 Test 1 ‘Down Test’ – Triple Seat**

*Published with permission from RECARO Aircraft Seating*
Aviation – 14 CFR 25.562 Test 2 ‘Forward Test’ – Quad Seat

Published with permission from RECARO Aircraft Seating

Aviation – 14 CFR 25.562 Installation/HIC Test

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