

# STRUCTURES AND MATERIALS PERFORMANCE

## ***Structural Testing and Evaluation***

The NRC Institute for Aerospace Research (NRC Aerospace) offers equipment and expertise for structural testing and evaluation in a broad range of load and environmental conditions. NRC Aerospace can provide static and cyclic load tests on everything from simple coupons to full-scale aircraft. We can also perform tests to confirm the structural integrity or to demonstrate the regulatory compliance of aerospace structures.

Some of our equipment is unique. Our biaxial test facility is the largest in Canada, and our environmental test facility can perform load and environmental profiles simultaneously. There are state-of-the-art facilities for drop tower impact testing and corrosion testing, and we provide access to Canada's largest flight impact simulator. These facilities complement a full-scale test bay for aerospace vehicles and components. All equipment is complemented by advanced data acquisition systems and inspection capabilities.

### **Expertise**

NRC Aerospace researchers are recognized for their ability to design and develop test programs to meet airworthiness and space authorities' compliance standards, perform most ASTM tests, develop programs for computer-controlled load frames, and maintain links with domestic and international testing organizations. Most importantly, they deliver – on time and at competitive rates.



*The SMPL management system has been registered to ISO 9001:2000*



*Structural test frames*

### **Description of facilities**

- **Uniaxial servo-hydraulic structural test frames**  
Closed-loop uniaxial test frames rated between 900 and 9 kN (200 and 2 kips). Computer controls enable customized static or cyclic tests. Each system includes data acquisition for monitoring load, strain and stroke. Additional channels are available for instrumentation. Environmental chambers can be mounted for testing from -70 to 200°C (-95 to 395°F).
- **Uniaxial universal screw machines**  
Test frames range from 9 kN (2,000 lb) to 2.67 MN (600,000 lb).
- **Biaxial servo-hydraulic structural test frame**  
For cruciform type specimens, this test frame is rated for 225 kN (50 kips) along both axes. With a phase shift controller, tests can be carried out with tension on one axis and compression on the other.

*...cont'd*

- **Environmental chambers**

- a) **Temperature control chamber**

Portable temperature chamber used with the load frames. Can be used for thermal cycling of specimens and features two configurations: eight programs of four steps each, or four programs of eight steps each.

- Temperature range: -100 to 250°C (-240 to 485°F)
- Control: ±1°C
- Test space: 85 x 25 x 32 cm (33 x 10 x 13 in)

- b) **Temperature-humidity conditioning chamber**

- Temperature range: -20 to 150°C (-4 to 300°F)
- RH range: 30% to 90%
- Test space: 1 x 1 x 1 m (3 x 3 x 3 ft).

- **Drop tower impact facility**

- Type: Dynatup Model 8200
- Crosshead weight: max. 15 kg (33 lb), min. 5.7kg (12.5 lb)
- Drop height: up to 213 cm (84 in)
- Impact energy: up to 285 J (210 ft-lb)
- Impact velocity: up to 386 m/min (1,274 ft/min)
- High-rate data acquisition system.

- **Salt fog corrosion test facility**

- Temperature range: ambient to 55°C (130°F)
- RH range: 10% to 100%
- Capacity: 850 L (187 gal)
- Exhaust condenser/recirculation water conservation system
- Three chambers are available.

- **Autoclave**

- Temperature range: ambient to 370°C (700°F)
- Pressure range: up to 1.4 MPa (200 psi)
- Working space: Diameter: 1.2 m (4 ft)  
Length: 1.8 m (6 ft).

- **Large-scale test facility**

Fully adaptable test rig has numerous hydraulic actuators with protection devices. Load channels are computer-controlled for extensive error and limit checking using one of 3 available MTS multi-channel load controllers. Over 700 channels of data acquisition can be integrated with the test controllers. Related facilities include access



Full-scale fatigue tests on CF-18 wing for International Follow-On Structural Test Program

to a flight impact simulator for certification tests and experimental investigations of flight vehicle response to impacts. The latest non-destructive inspection methods are used to monitor test specimens.

- Size: 25 x 18 x 7 m high (80 x 60 x 20 ft high)
- Hydraulic power supply: 530 L/min at 20,000 kPa (140 GPM at 3000 psi).

**CONTACT:**

Mr. Nick Bellinger  
Structures & Materials Performance Laboratory  
NRC Institute for Aerospace Research  
Ottawa, Ontario, Canada K1A 0R6  
Tel: (613) 993-2410 Fax: (613) 952-7136  
E-mail: [nick.bellinger@nrc.gc.ca](mailto:nick.bellinger@nrc.gc.ca)

Mr. Jeff Mackwood  
Marketing and Contracts Office  
NRC Institute for Aerospace Research  
Ottawa, Ontario, Canada K1A 0R6  
Tel: (613) 990-0765 Fax: (613) 952-7214  
E mail: [jeff.mackwood@nrc.gc.ca](mailto:jeff.mackwood@nrc.gc.ca)

Or visit our Web site at: [www.nrcaerospace.com](http://www.nrcaerospace.com)

January 2006  
Aussi offert en français  
IAR-SM02e