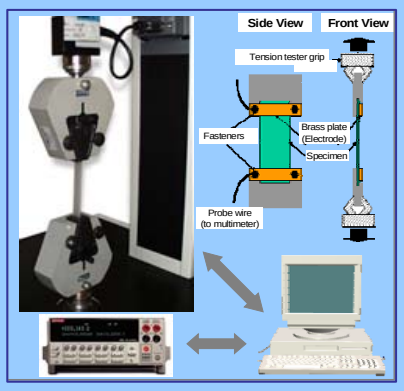
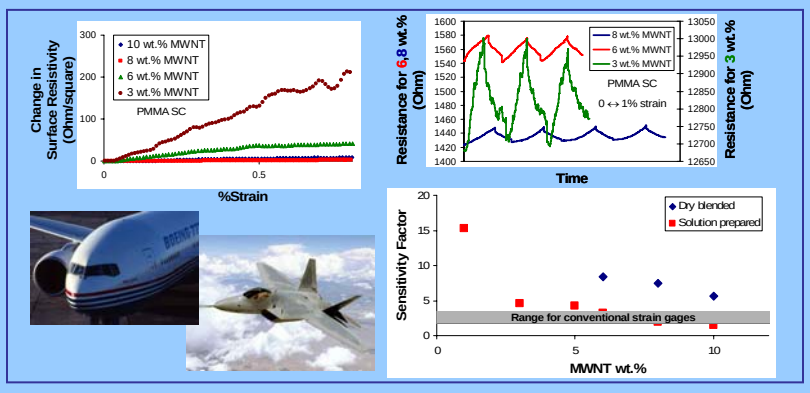
# Synopsis:
# Strain Sensing, Polymer Matrix Nanocomposites




*In-situ electrical resistivity measurement system*




*Sensor characteristics, performance, and sensitivity*

## Background

Commercially available resistance-type strain gages offer wide static/dynamic and temperature ranges. However, these gages lack versatility and flexibility, as they can only measure strains at particular locations and in predefined directions. In addition, they exhibit a limited range of gage factor (typically 2.0-3.2). HPMI is developing conductive, polymer/carbon nanotube composite films that can be used as strain sensors with larger tunability in sensitivity. The sensors use the changes in conductive network structure at a nanoscale to measure macroscale deformations.

## Goals

- Develop multifunctional (durable and conductive), polymer/carbon nanotube composite films for high sensitivity strain sensing
- Develop a statistics-based, mathematical model to quantify the relationship between mechanical strain and change in electrical resistivity
- Incorporate the developed model to the production of strain sensors with tailored sensitivity

## Projects/Research Highlights

- Fabrication of conductive, polymer/carbon nanotube composite strain sensors
- Development of performance-predictive model
- Comprehensive testing of sensor characteristics, performance, and reliability
- Instrumentation and electronic packaging of sensor systems for scale-up production

## Benefits to Industry

- Cost-effective strain sensors with higher sensitivity and larger sensitivity-tunability
- Mechanically strong and durable
- Versatility in location and direction of strain measurement
- Multifunctional nanocomposites suitable for health monitoring, electrostatic charge mitigation, and failure prevention
- Provide unique functionalization methods for enhancing tube dispersion and interfacial bonding