Wakeshield: A Space Experiment Platform

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The Wake Shield Facility:
A Space Experiment Platform

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Wake Shield Facility (WSF) Flight Program

CCDS Objectives:
- Produce new industry-driven electronic, magnetic, and superconducting thin-film materials and devices both in terrestrial laboratories and in space
- Utilize the ultra-vacuum of space for thin-film epitaxial growth and materials processing
- Explore commercial possibilities of space for:
  - epitaxial thin-film growth
  - materials purification
- Develop commercial space hardware for research and development and enhanced access to space

The SVEC - WSF Team:
- NASA
- U of H
- University of Illinois (Urbana)
- Univ. of Colorado (Col. Springs)
- University of Toronto
- Case Western Reserve Univ.
- U.S. Army - AMTL
- U.S. Army - CERL
- Battelle Laboratories

Product Applications:
- High-quality, thin-film semiconductor materials used in computer and other microelectronic applications; superconducting thin-film development for device applications
- Epitaxial thin-film products for fiber-optic communication applications
- Epitaxial thin-film products used in infrared surveillance devices
- Solid-state, thin-film laser diodes used for next generation tuned laser sources

Importance of WSF Flight Program:
- Access to space ultra-vacuum which will allow for advanced technologies in materials processing
  - ultra-vacuum feature of space has never been used
  - vacuum 10,000 times better than on earth systems
- Provides future national resource with a unique capability to produce advanced semi-conducting and super-conducting materials leading to future computer, communications and sensor systems
Wake Shield Facility (WSF) Flight Program

**Commercial Development Approach:**
- Low cost
- Design simplicity
- Proven technology
- Reduced documentation & testing
- Highly coordinated project team
- Safety compliance - highest priority

**WSF Utilization Potential:**
- Experiments which require:
  - access to ultra vacuum
  - gravity level < 10^{-6} \, g
  - low power over long durations
  - high power for short durations
  - near-term free flyer opportunity
  - 60 to 90 day missions
  - space environment exposure
- Test platform for space power, space propulsion and space robotics

**Importance of WSF Free Flyer:**
- Technical
  - improve vacuum environment/thin-film growth conditions
  - reduce impact on Orbiter operations
- Programmatic
  - reduced overall cost to NASA
  - quick route to commercialization
- National Impact
  - WSF brings NASA the capability of a U.S. Free Flyer for STS

**Cooperative Experiments**
- Air Force Geophysics Laboratory
  - plasma diagnostics
  - ion capture in wake region
- Case Western Reserve University
  - ram flow diagnostics
  - materials exposure
- Battelle Laboratories
  - zeolite crystal growth
- Army - CERL
  - material coatings - vapor deposition