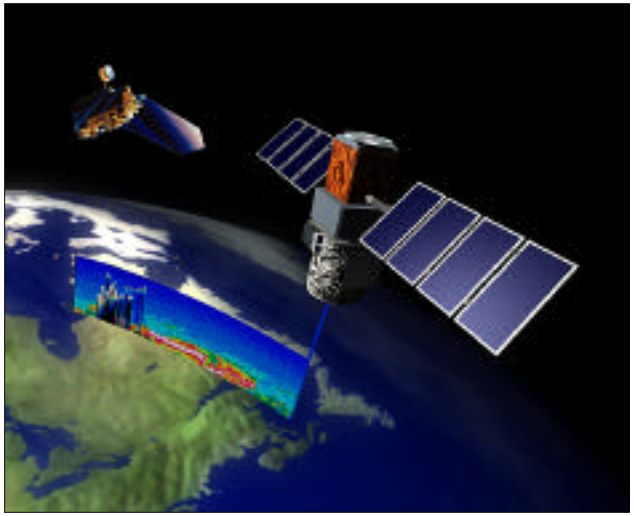
LaRC Participation in ESE Technology Development Programs

- ESE Advanced Technology Initiative (formerly Sensor & Detectors)
  - ***Development of "seed corn" core technology***
    - DIAL
    - Cloud & Aerosol Lidar
    - 2-micron Winds Xmitter
    - Adv. FTS
    - STAR
    - Reflective GPS
    - Adv. Imaging
    - Submm. LO
    - Broadband FIR Detectors
    - GEO IR LFPA's

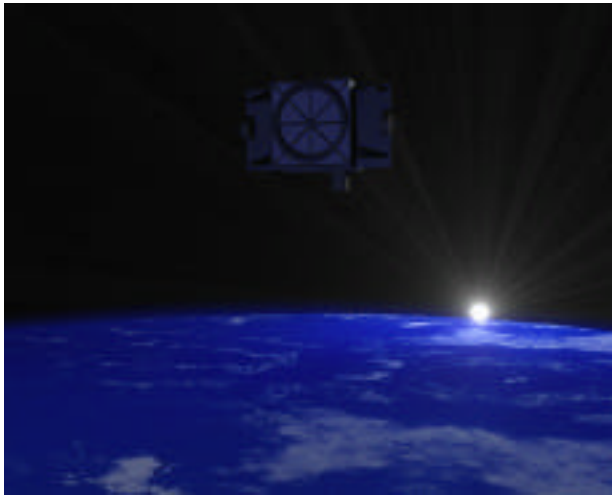
- Instrument Incubator Program (IIP)
  - ***Bridges the technology gap***
    - GAMS
    - Radiometric Performance Of Mesh Antenna (for JPL)
- New Millennium Program (NMP)
  - ***Provides space validation***
    - EO-1= Carbon-Carbon Radiator
    - EO-2= Enabling Coherent Lidar Transmitter Technology
    - EO-3= GIFTS and GeoTrace, 2 of 4 concepts selected for Phase A Study

Technology Product Areas

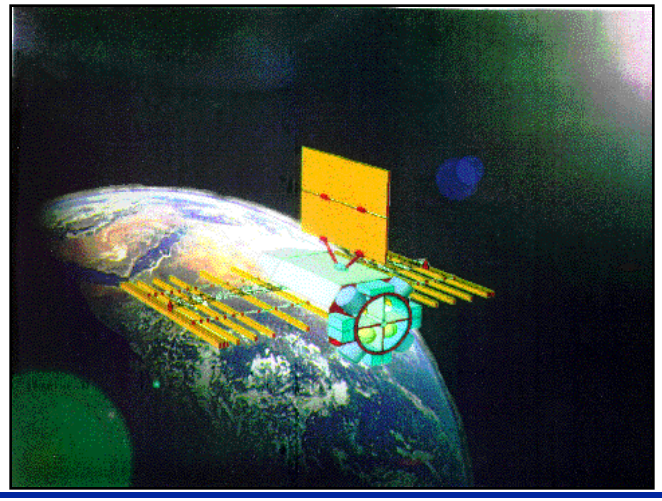
Lasers/Lidar



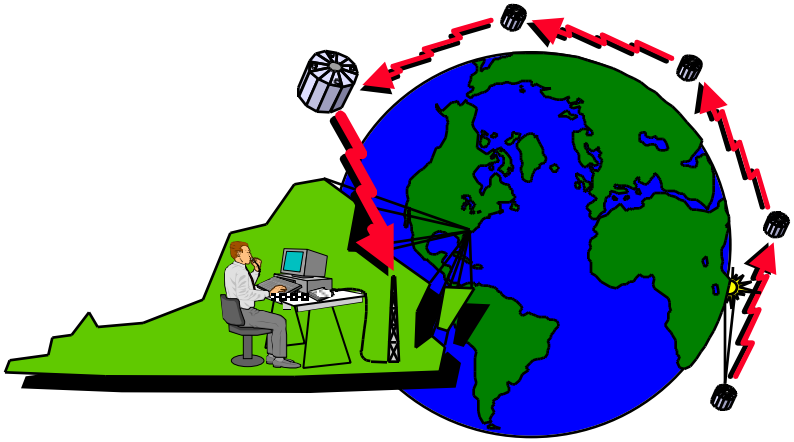
Electro-Optic Sensors



Microwave Sensors



Data Systems

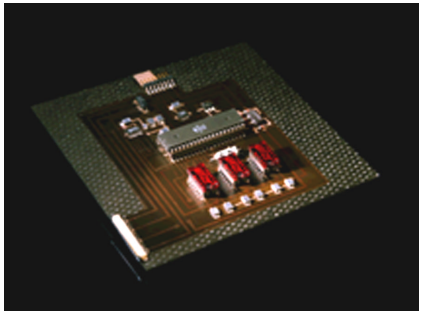


Technology Product Areas

Breakthrough Materials

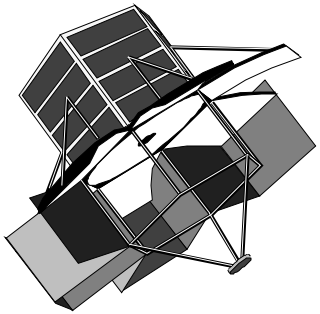
Space-Durable Polymers

Lightweight & Multifunctional Structures



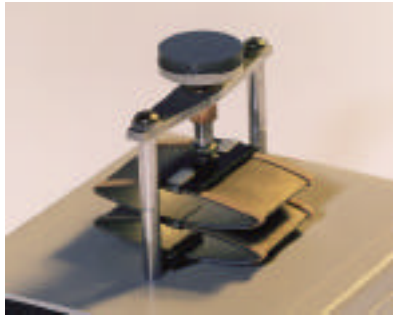
Multifunctional Structures

Deployable and Inflatable Structures



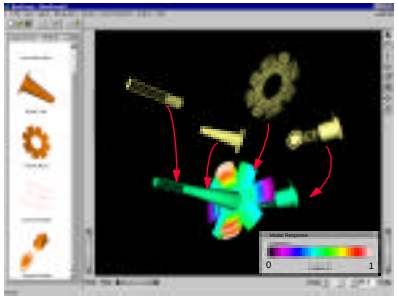
Precision Deployable Reflectors

Structural Dynamics & Geometry Control



Advanced Actuators

Next Generation Design & Analysis



Next Generation Design & Analysis Tools

FY99 Program Summary

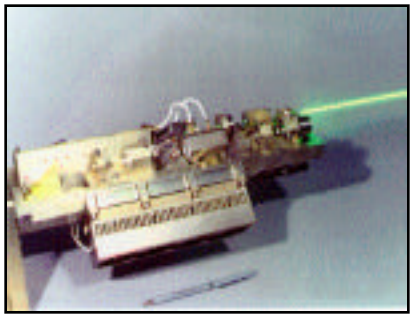
	PIT Leader	D Hinton	S Sandford	A Little	W Roettker	E Kist	J Stadler	J Williams-Byrd	U Singh	J Johnson	S Sandford	S Katzberg	H Benz
	R&T Project	FTS	GAMS	GEO TROP SAT	FPI	Advanced CERES	Clouds & Aerosols LIDAR	DIAL	Winds	STAR Technology	Submillimeter LO	GPS Surface Reflection	Advanced Imaging
Product Line	Product Line Leader												
Passive Electo-Optic Sensors	S. Sandford	X	X	X	X	X							
Active Optical (LIDAR)	J. Barnes						X	X	X				
Microwave Sensors	J. Johnson									X	X	X	
Instrument Data Processing	H. Benz	X	X										X
Lightweight & Multifunctional Structural Sys	S. Thibeault	X	X		X		X						
Breakthrough Materials	H. Maahs	X	X		X								
Deployable and Inflatable Structures	M. Lake						X	X					
Structural Dynamics and Geometry Control	H. Adelman	X	X										

Sensors & Detectors

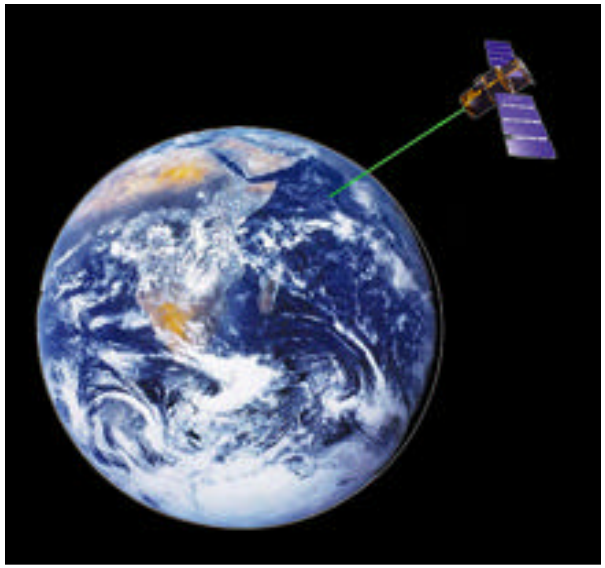
Structures & Materials

Enabling Lidar Atmospheric Measurements from Space

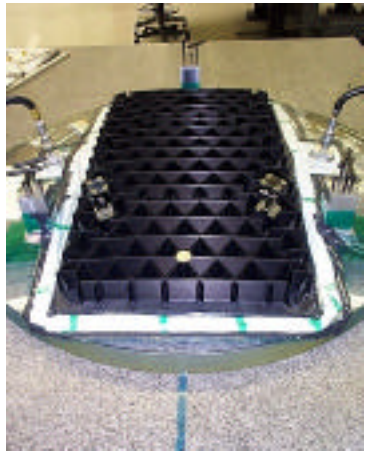
Laser Materials Modeling



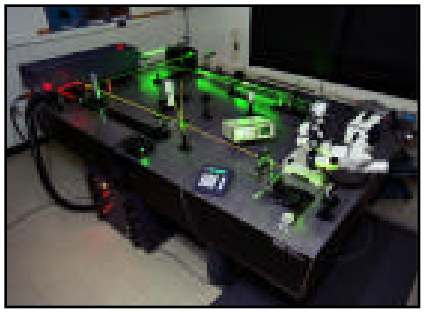
Diode-pumped laser transmitters (UV-IR)



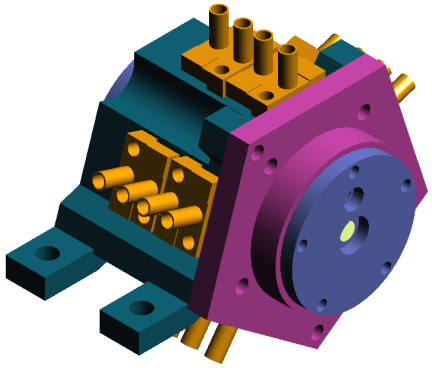
Active Measurements of Cloud & Aerosols, Water Vapor, Ozone, and Winds



Composite Mirror Panels



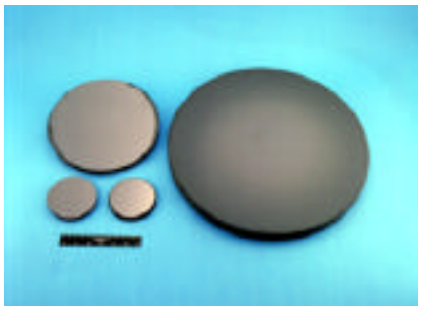
Lab Demonstrations



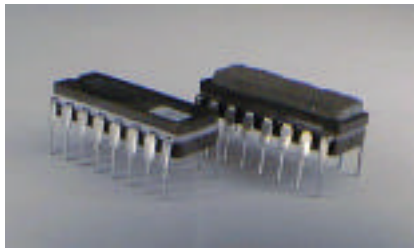
High Thermal Conductivity C-C Composite Dissipaters

Precision Latch & Hinge Deployment Mechanisms

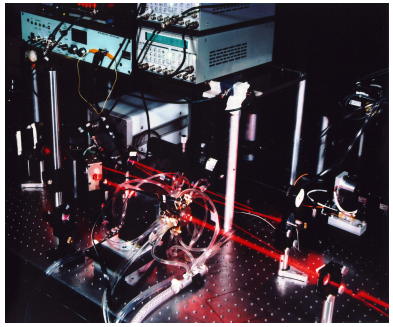
Fourier Transform Spectrometer (FTS) Technologies



Light Weight Optics

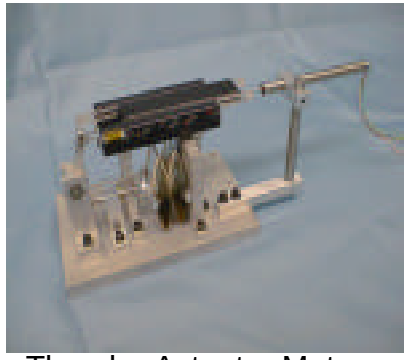


Radiation Shielding

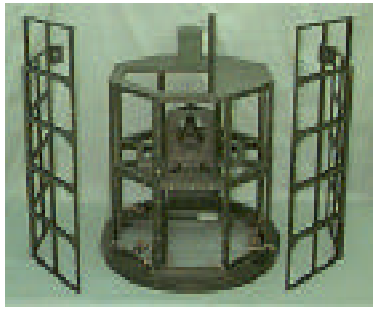


Stable Laser Metrology

Advanced FTS Applications
(LEO & GEO)
- Atm. Chemistry
- Atm. Sounding

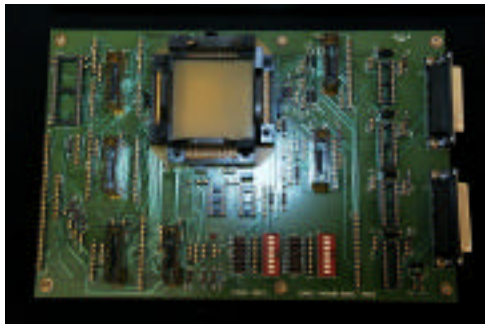


Thunder Actuator Motor



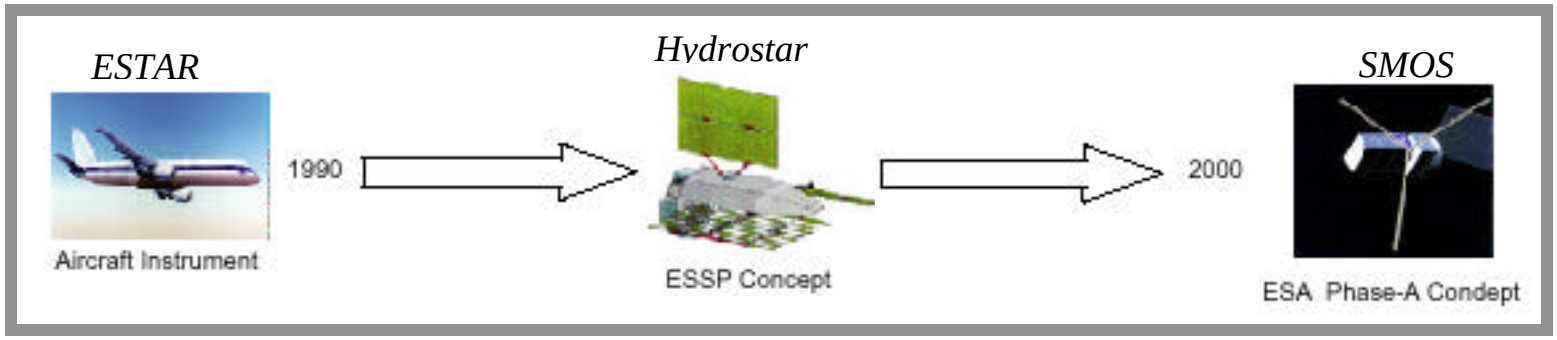
Multifunctional Composite Structures

Compact Optical Design (“Web”)



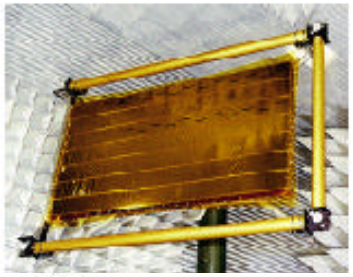
DSP w/ FFT

STAR Technology Development



Lightweight Deployable Arrays

Inflatable Membrane Array



Array Calibration Errors

Composite Truss

10 m Aperture
16 Elements
95% Composites
60 kg Mass

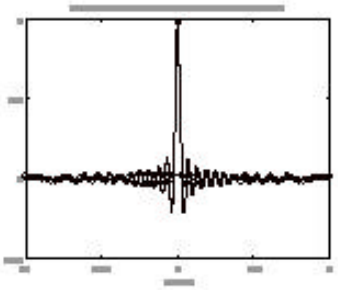
Single Bay Prototype

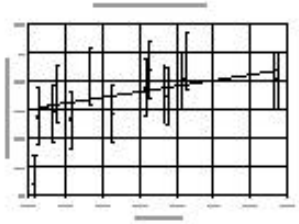
Characterization
Model Verification

Radiometer System Demonstration

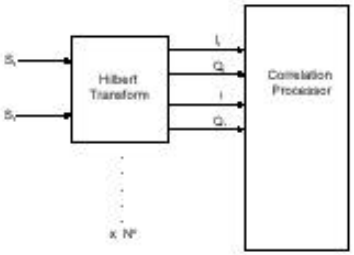
Advanced System Concept

G-Matrix Calibration
Radiometer Stability
Signal Processing
Algorithm Sims.



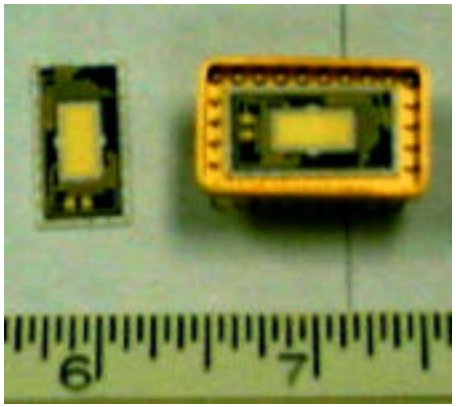


Digital Processing Architectures

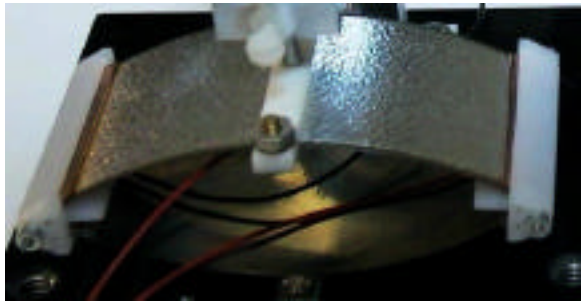


GAMS: Next Generation Measurements of Atmospheric Ozone and Aerosols from Space

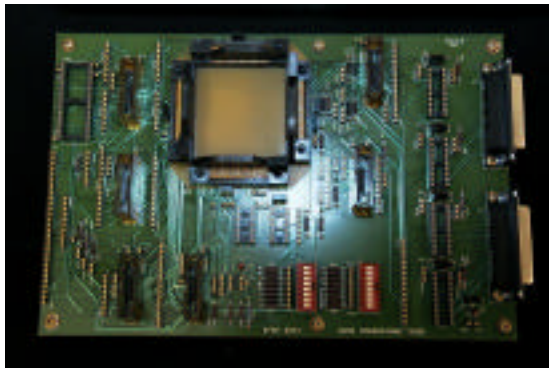
C-C Spectrometer Head



Detector Array



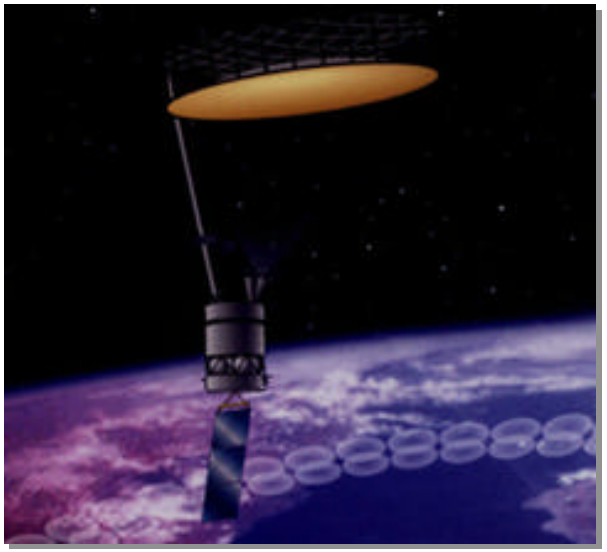
Thunder Actuators



MCM Host Onboard Algorithms

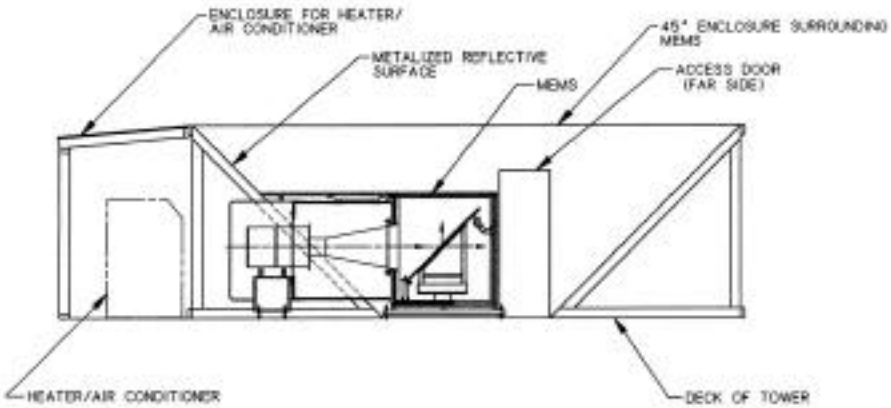
Radiometric Performance of Mesh Reflector

Determine performance of mesh for precision brightness temperature measurements in L- to C- band frequency range and provide analysis to determine the impact of the mesh reflector on radiometric system performance. Supports JPL IIP Project.



Ocean-Salinity Soil-moisture Integrated Radiometer Imaging System (OSIRIS) (JPL Concept)

Materials Emissivity Measurement System (MEMS) will provide a direct radiometric measurement of the emissivity of the mesh sample.



ESE Capability Needs Assessment
- Traceability of LaRC Technology -

R&T Project	Science Driver	Science Theme	Earth Sys. Quantity
Differential Absorption Lidar (DIAL)	Seasonal-to-Interannual Climate Variability & Prediction	Atmospheric Circulation	Global temp. & moisture profiles
	Natural Hazards Research & Applications	Severe Storms	Hurricane Assessment
	Atmospheric Chemistry & Ozone Research	Lower Trop. Chemistry	Global distr. & total column ozone & other chemical species
	Atmospheric Chemistry & Ozone Research	Strat. & Upper Trop. Chemistry	Profiles of temp., ozone & other trace constituents
	Atmospheric Chemistry & Ozone Research	Lower Trop. Chemistry	Global distr. & total column ozone & other chemical species

ESE Capability Needs Assessment
- Traceability of LaRC Technology -

R&T Project	Science Driver	Science Theme	Earth Sys. Quantity
Fourier Transformer Spectrometer (FTS)	Seasonal-to-Interannual Climate Variability & Prediction	Atmospheric Circulation	Global temp. & moisture profiles
	Seasonal-to-Interannual Climate Variability & Prediction	Atmospheric Circulation	Frequent regional temp. & moisture profiles
	Long-Term Climate: Natural Variability & Change Research	Cloud Radiation Feedback	Cloud profiles & properties
	Atmospheric Chemistry & Ozone Research	Strat. & Upper Trop. Chemistry	Profiles of temp., ozone & other trace constituents
	Atmospheric Chemistry & Ozone Research	Lower Trop. Chemistry	Global distr. & total column ozone & other chemical species