Section 3

Advanced Land Imager

Advanced Land Imager (ALI)

- ***ALI is an instrument incorporating several new technologies that promise better, lower cost performance for future Landsat missions***
  - ***The relatively warm operating temperature of the HgCdTe detectors enables passive cooling of the focal plane which greatly simplifies instrument operation***
- ***ALI was designed, assembled, environmentally tested and calibrated by the MIT Lincoln Laboratory***
  - ***The Focal Plane System was supplied by Raytheon/ SBRS***
  - ***The telescope was supplied by SSG Inc.***

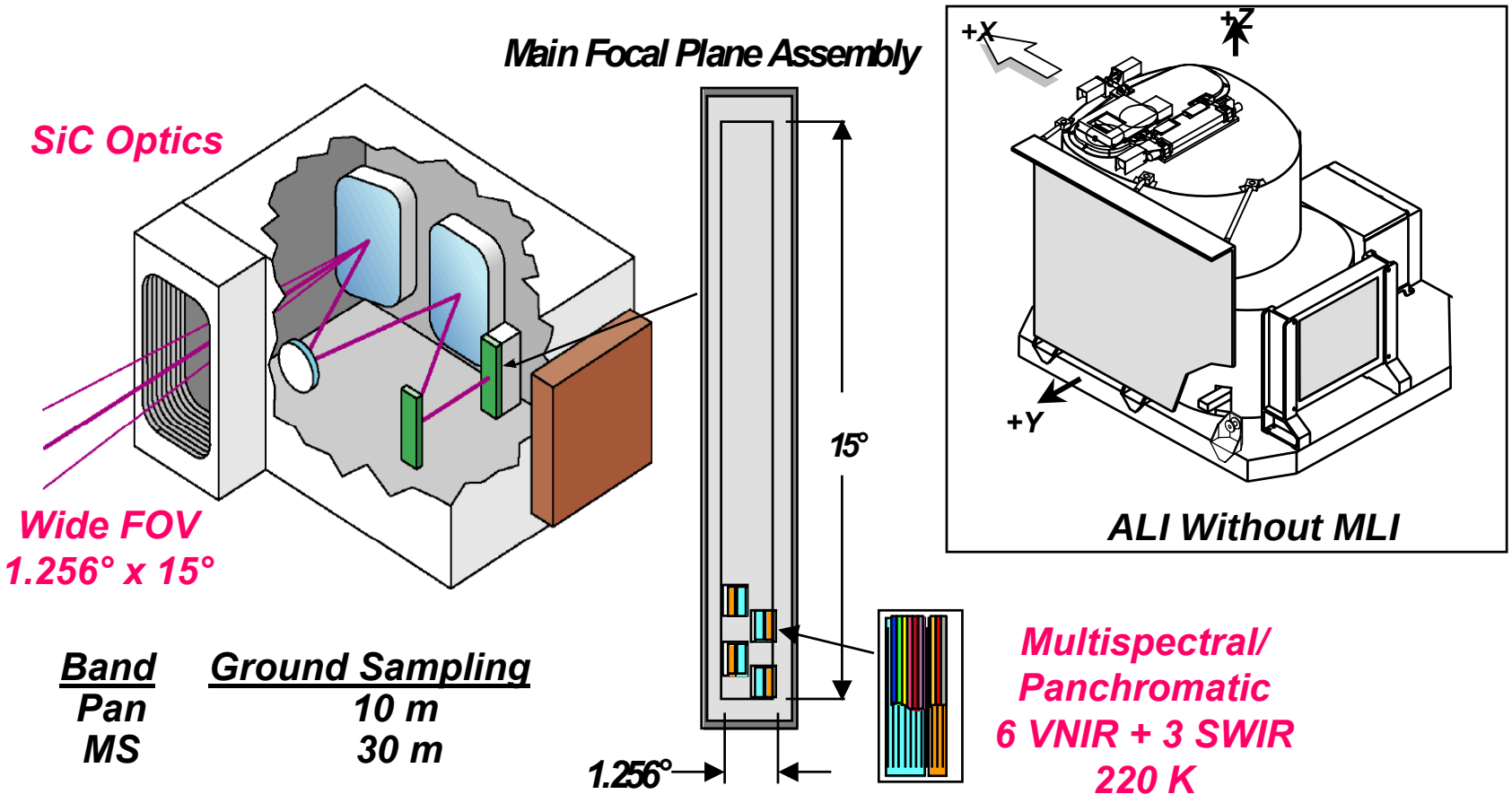
Key ALI Specifications

June 4, 2002

- ***Meet or exceed ETM+ performance (w/o thermal band) at minimum size, weight, schedule, and cost***
- ***Spectral band suite was augmented for science reasons***
  - ***Split band # 4 into two sub-bands***
  - ***Add bands at 442 nm and 1244 nm***
  - ***Reduce spectral width on the Pan band***
- ***Pan band GSD reduced to 10m***
- ***Dynamic range to cover >100% albedo with one gain state***
- ***Minimum sensor size driven by image sharpness (MTF)***
- ***SNR four to ten times ETM+ values, depending on band***
- ***Demonstrate spatial, spectral, and radiometric calibration for large detector arrays***
- ***Other performance goals guided by Landsat-7***

Advanced Land Imager (ALI)

June 4, 2002



Band	Ground Sampling
Pan	10 m
MS	30 m

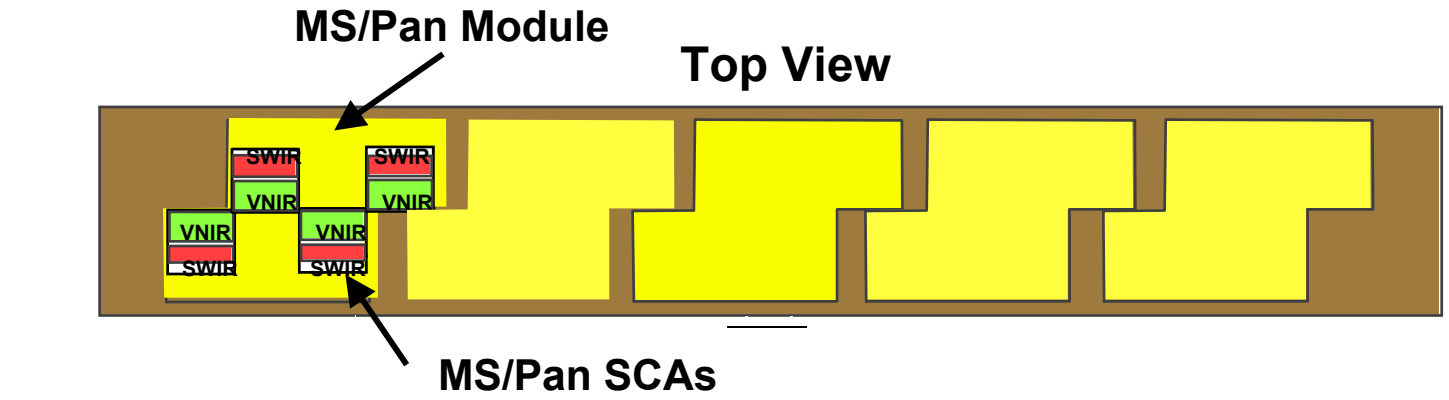
Multispectral/
Panchromatic
6 VNIR + 3 SWIR
220 K

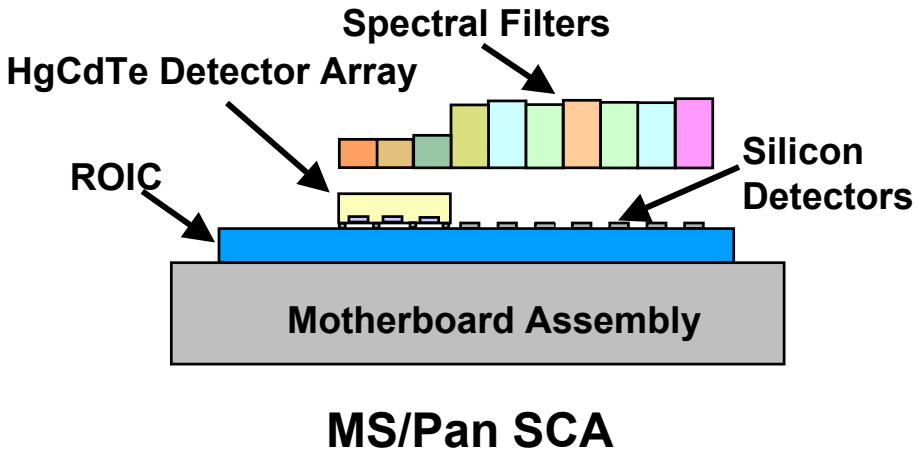
Partially Assembled Flight ALI

Telescope features

- ***12.5 cm entrance pupil***
- ***15° x 1.26° field-of-view***
- ***Telecentric, f/7.5 design***
- ***Unobscured, reflective optics***
- ***Silicon carbide mirrors***
- ***Wavefront error = 0.11 λ RMS @ 633 nm***

Main Focal Plane Assembly

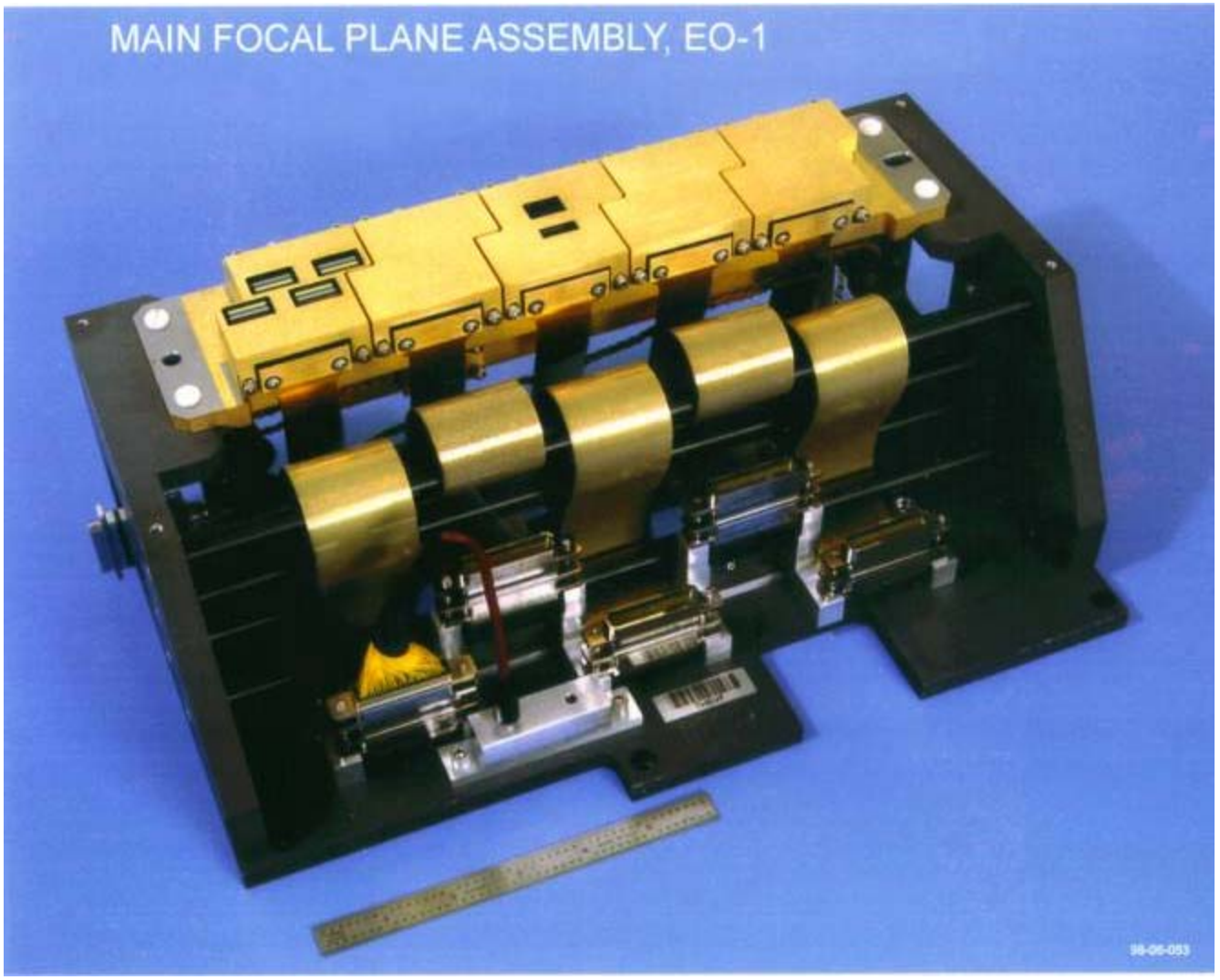




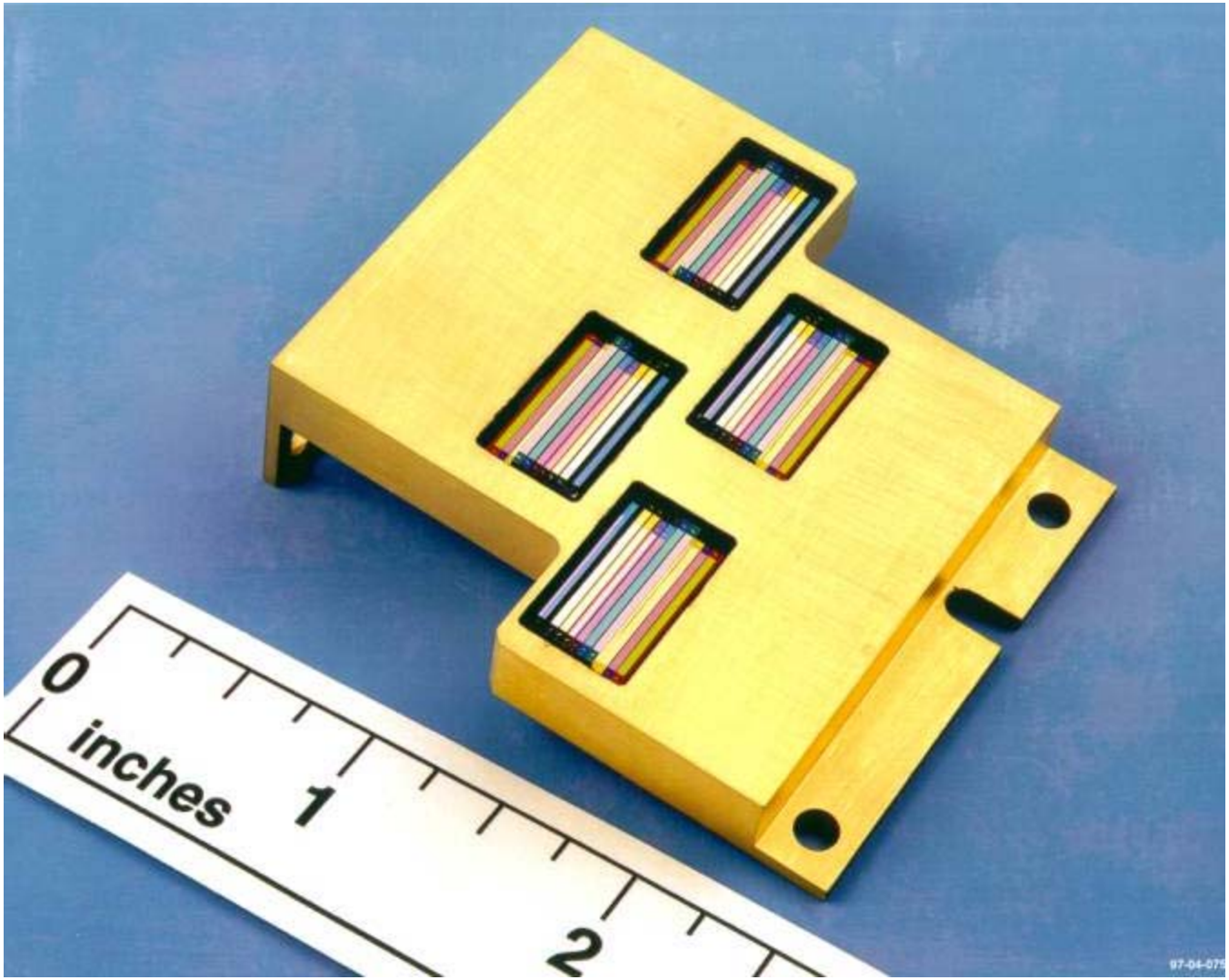
MS/Pan SCA

MS : Multispectral
Pan : Panchromatic
ROIC : Read-out Integrated Circuit
SCA : Sensor Chip Assembly
SWIR : Short Wave Infrared
VNIR : Visible Near Infrared

ALI Focal Plane Assembly



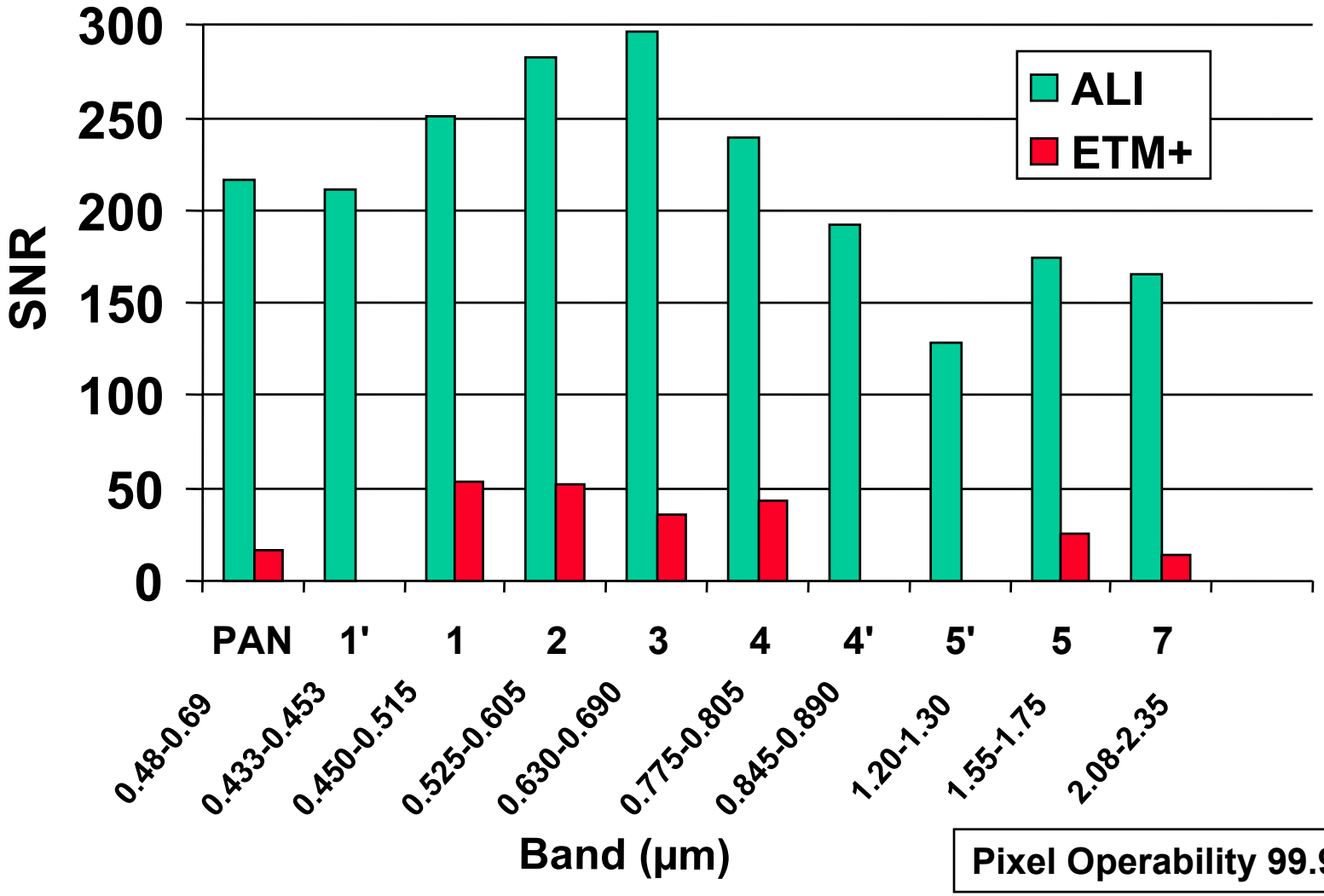
MS/PAN Flight Module



ALI SNR Performance

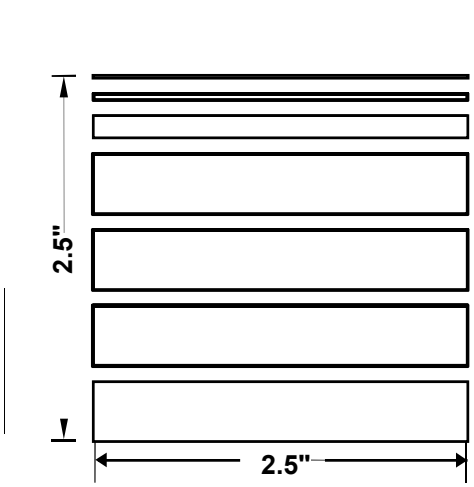
@ 5% Earth Surface Reflection

June 4, 2002

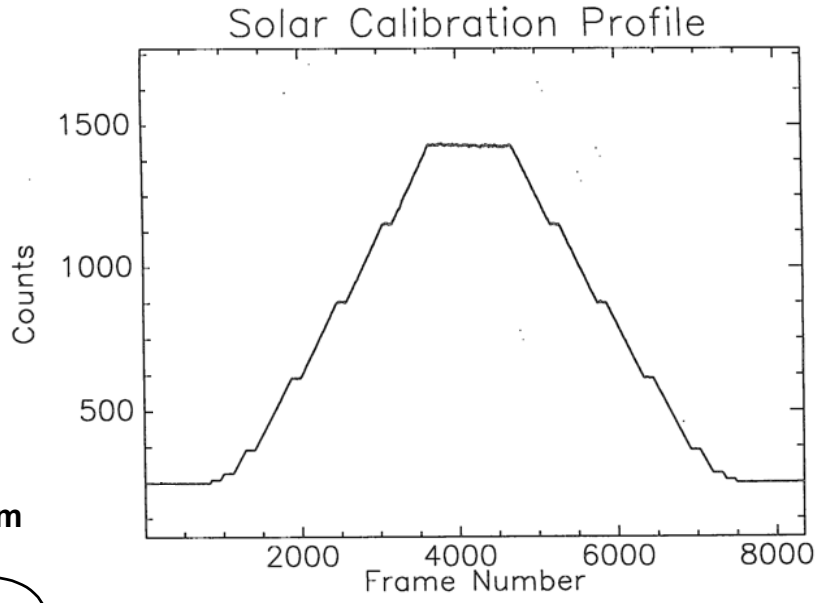


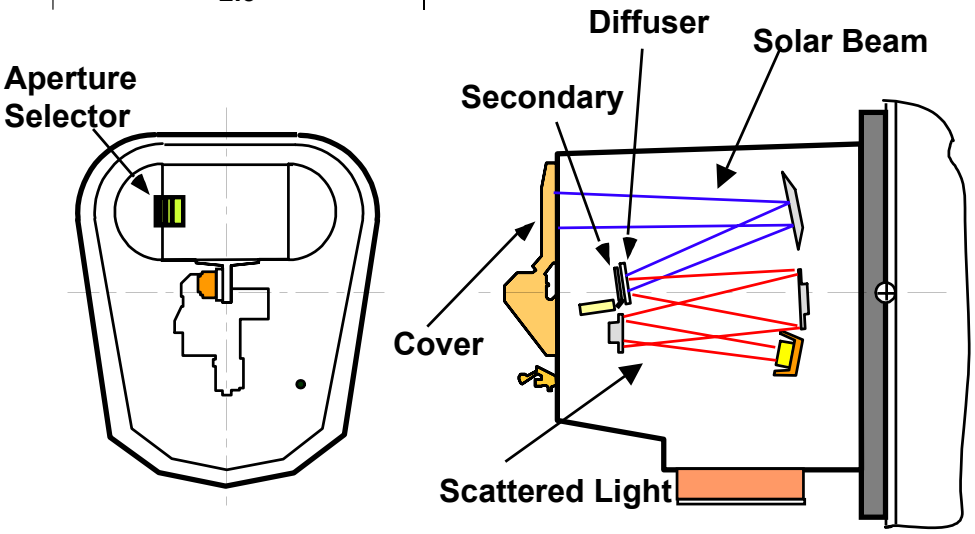
Pixel Operability 99.94%

Solar Calibration



Signal Level	Cumulative Signal
1%	1%
2%	3%
7%	10%
20%	30%
20%	50%
20%	70%
20%	90%

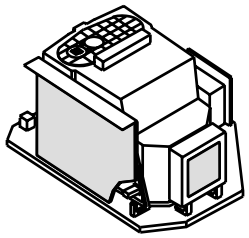


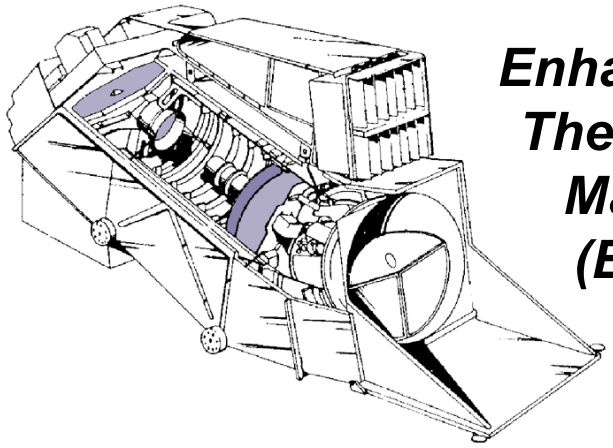


Landsat Instrument Comparison

June 4, 2002

ALI Based Concept for Future Landsat Instrument





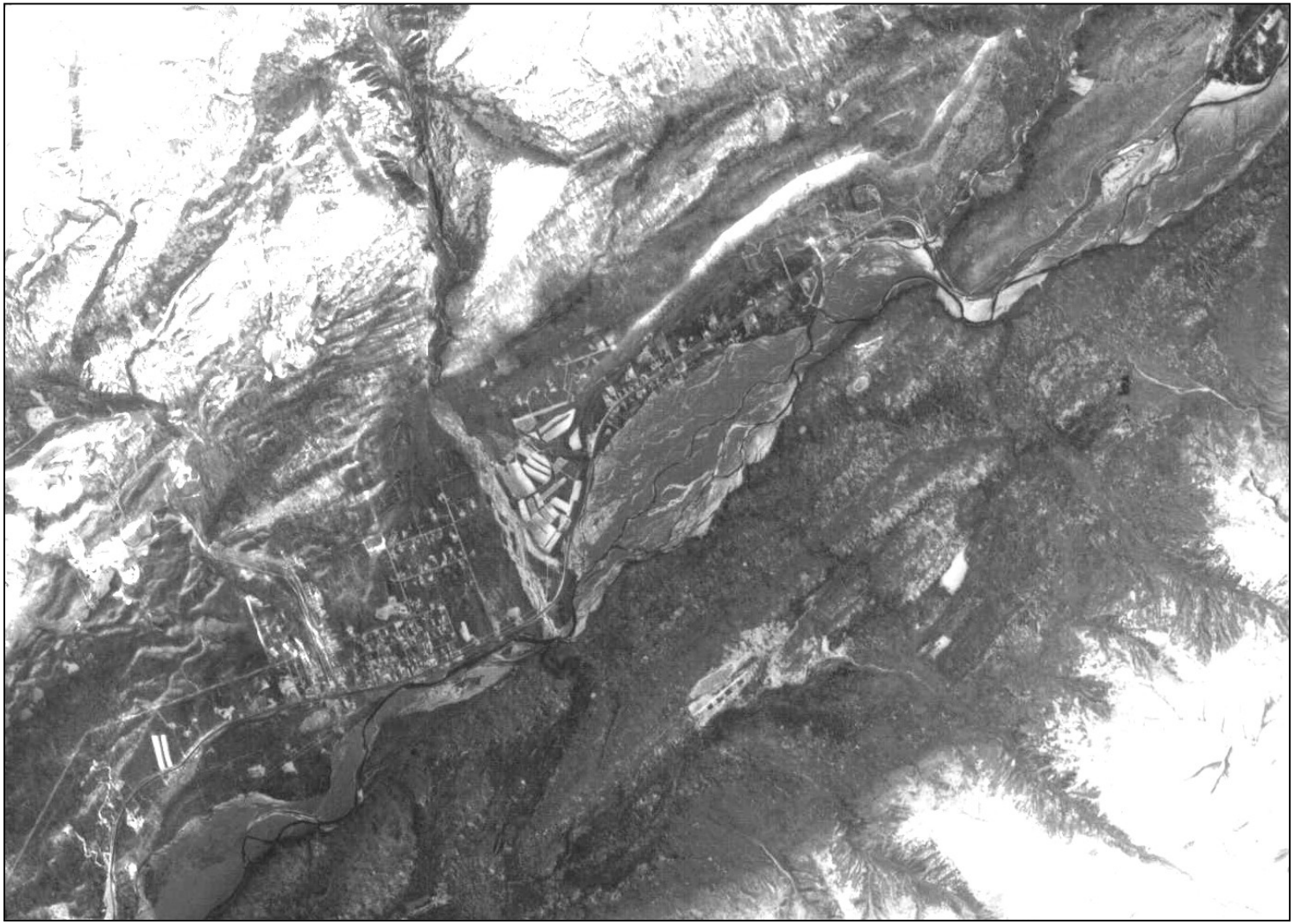
Enhanced Thematic Mapper (ETM+)

100	Mass (kg)	425
100	Power (W)	545
0.2	Size (m^3)	1.4
80X50X50	Size (cm)	196X114X66
10	VNIR / SWIR Bands	7
6200	Detectors Per Band	16
None	Thermal Bands	1
400	Data Rate (Mbps)	150
10	Pan Resolution (m)	15
5	Relative SNR	1

First ALI Image: Sutton, AK

June 4, 2002

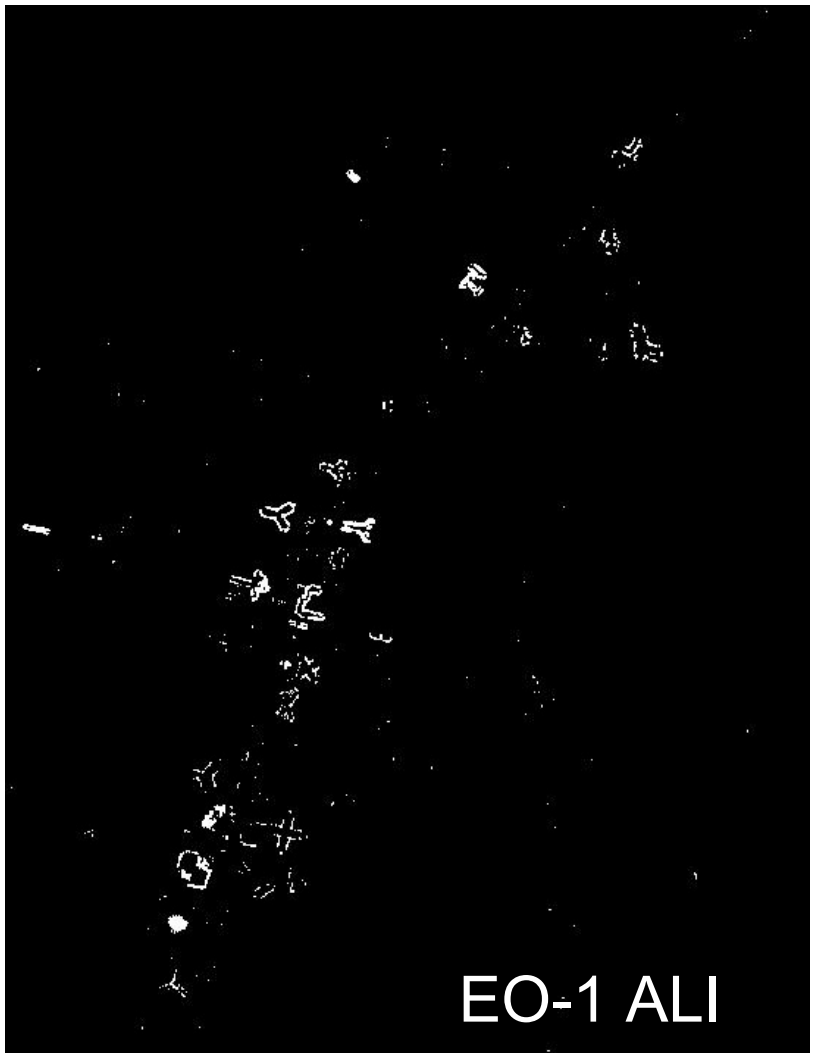
(2000:330, Pan zoom)

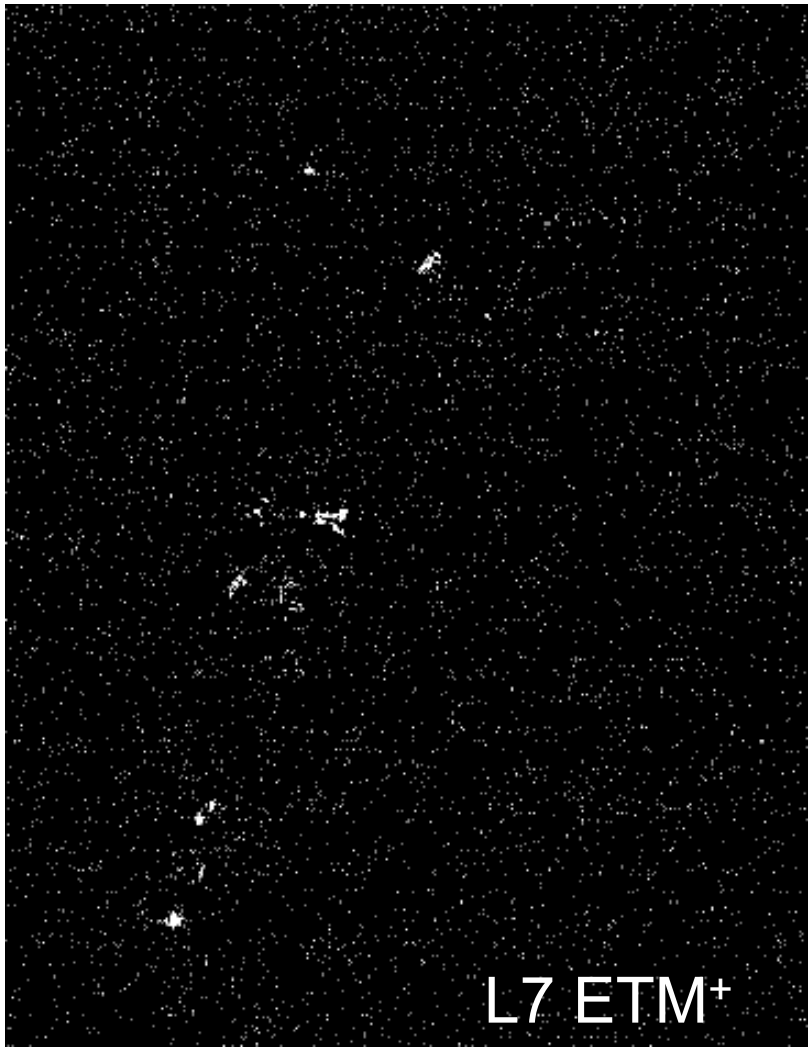


Landsat-7 & ALI Comparison (Sutton, AK)

Sensitivity

Las Vegas at night 2001:093, Pan



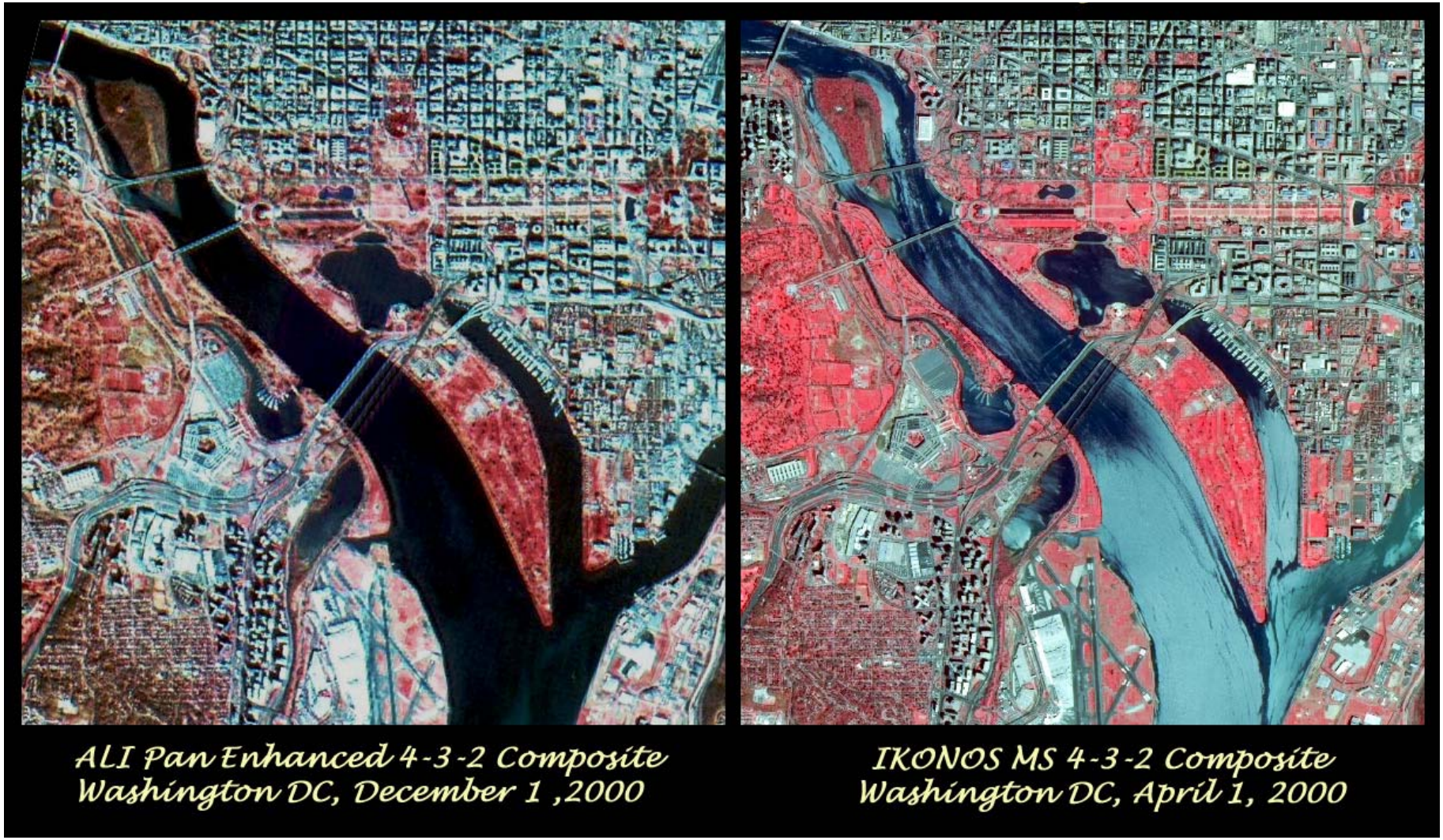


Washington, DC

(2000:336, Pan)

EO-1 / ALI & IKONOS Comparison

June 4, 2002



Cape Canaveral

June 4, 2002

(2001:013, MS 4-3-2)

Oahu,HI
(December 19, 2000)

Pearl Harbor Area


Pearl City
Arizona Memorial
Ford Island
Missouri Memorial
Hospital Point
Hickam Field
Pearl Harbor
Honolulu International Airport
Barbers Point
EO-1 ALI Real Color
Pan Sharpened


Airplane on Taxiway
Honolulu International Airport
Pan Sharpened ALI Real Color

Mount Etna - July 22, 2001

ALI Pan Enhanced
Bands 3-2-1

Hyperion
7-5-4 Equivalent

EO-1 ALI
Bands 7-5-5’

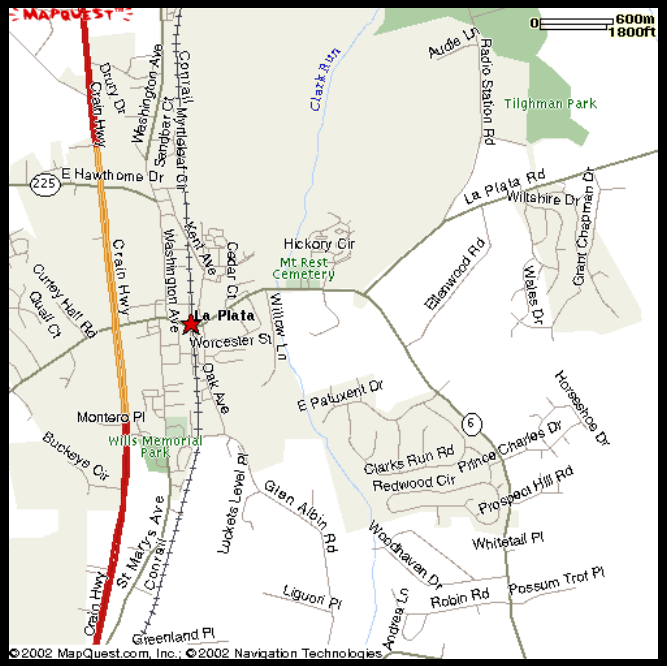
Manhattan, New York - EO-1 ALI Pan Band

March 13, 2001

September 12, 2001

La Plata, MD Tornado Scar

EO-1 ALI Pan-sharpened image below was taken on May 1, 2002. MapQuest map and air-photo to left are of pre-tornado vintage.



ALI Validation Issues

- ***Leaky Detectors***
- ***Focal Plane Contamination***
- ***Stray Light***

Summary

- ***ALI has validated three New Millennium Program Category 1 technologies on-orbit.***
- ***A new solar calibration scheme has also been validated.***