SPECTRUMASTRO

Spacecraft Overview Presentation

for the

GLAST LAT Collaboration Meeting

October 23, 2002

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OVERVIEW TOPICS

- **Spectrum Astro Overview**
- **GLAST Spacecraft Overview**
- **GLAST Instrument Accommodation Overview**

SPECTRUMASTRO

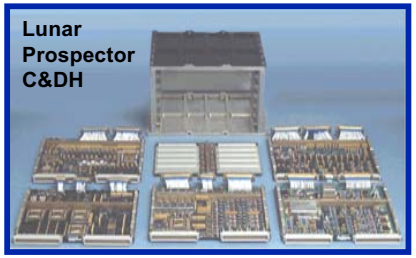
SPECTRUM ASTRO OVERVIEW

GLAST

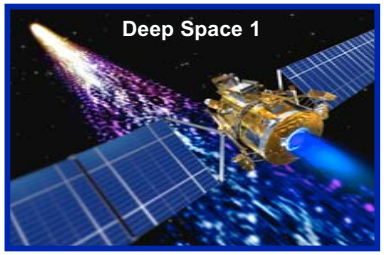
SPACE SYSTEMS — SATELLITES — FLIGHT & GROUND SOFTWARE — SPACE ELECTRONICS — FLIGHT DATA STORAGE

MSTI Series (1, 2 & 3)

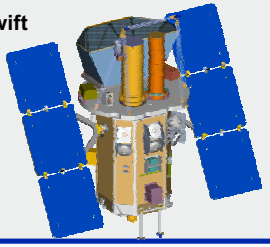
Lunar Prospector C&DH



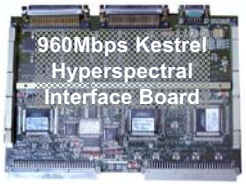
Deep Space 1



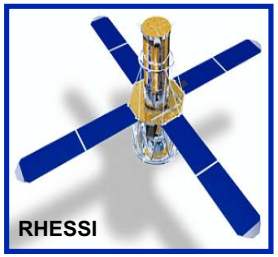
Swift



960Mbps Kestrel Hyperspectral Interface Board



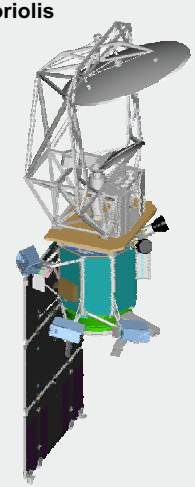
Astro-RT

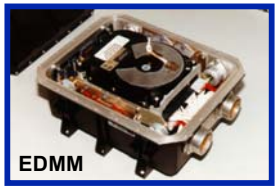


RHESSI

- We Are A Full Service, Streamlined Space Systems Company Established in 1988, ***Committed to Customer Satisfaction***
- Small Member of the Space Systems Industrial Base, But Very Capable – One of 6 US Companies Building Space Systems in the RSDO Catalog
- We Are An Employee Owned Business With 3X Industry Productivity, Low Overhead, and a "Get-It-Done" Culture
- We Produce Space Systems, Satellites, Space Hardware and Software, Ground Support Equipment and R&D Products
- We Have Demonstrated Consistent Successful Performance On Over 196 Contracts Valued at Over $780M
- Our Performance is Award Winning : Inc 500 (Twice), SBA Prime Contractor-Of-The-Year, Entrepreneurial Company-Of-The-Year, Manufacturer-Of-The-Year

Coriolis





EDMM

We Are "Committed to Keeping Our Customers Deliriously Happy"

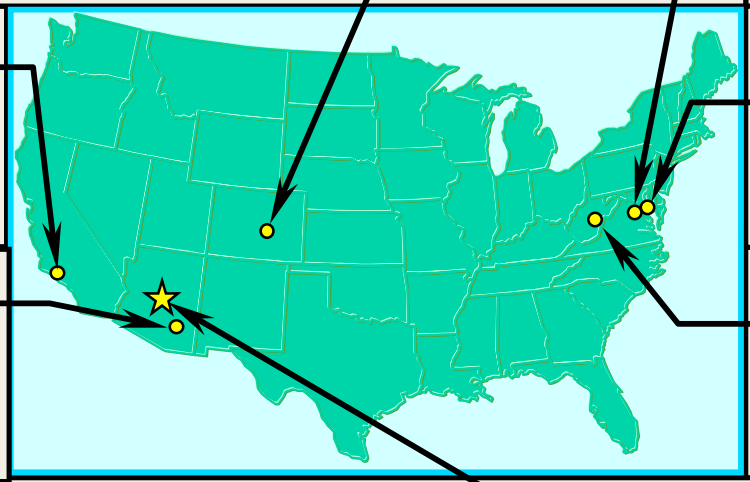
SPECTRUM ASTRO LOCATIONS

Started in Manhattan Beach, California in 1988, Spectrum Is Now Headquartered in Gilbert, Arizona And Has Nationwide Offices to Serve Our Customers

COLORADO SPRINGS, CO
- Customer Liaison and Ground Segment Engineering - 3,900 Sq. Ft.

HERNDON, VA
- Engineering, Customer Liaison - 7,100 Sq. Ft.

MANHATTAN BEACH, CA
- Engineering, Customer Liaison - 4,460 Sq. Ft.



WASHINGTON D.C.
- Legislative Affairs; Reagan Bldg - 3,400 Sq. Ft.

TUSCON, AZ
- Electro-Optics Center of Excellence – 5,000 Sq. Ft.

HARRISVILLE, WV
- Blanket/Component Mfg - 8,000 Sq. Ft.

GILBERT, AZ – HEADQUARTERS
- Corporate Administration, Engineering, Manufacturing, Integration, and Test - 140,000 Sq. Ft.

A Nationwide Presence to Serve Our Customers

SPECTRUMASTRO

FLIGHT PROGRAMS

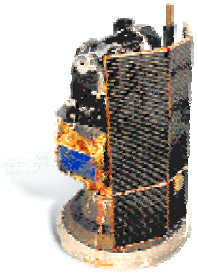
GLAST

Launched

MSTI

1
1992

2
1994



3
1996

Deep Space 1

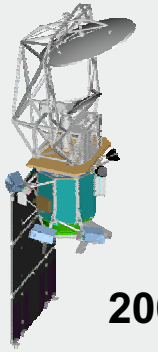
1998

MightySat II.1

2000

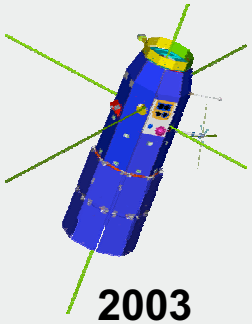
Under Contract

Coriolis



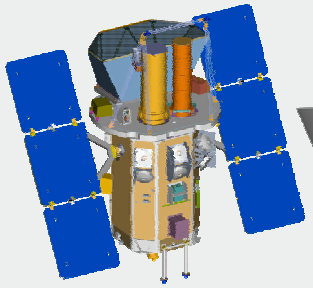
2002

C/NOFS



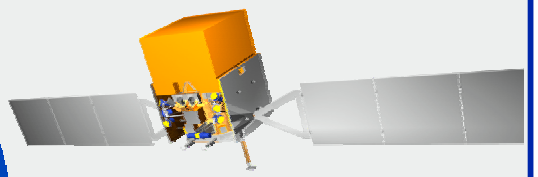
2003

Swift



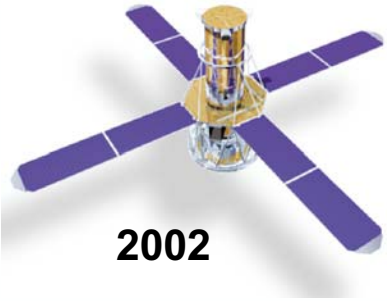
2003

GLAST



2006

RHESSI



2002

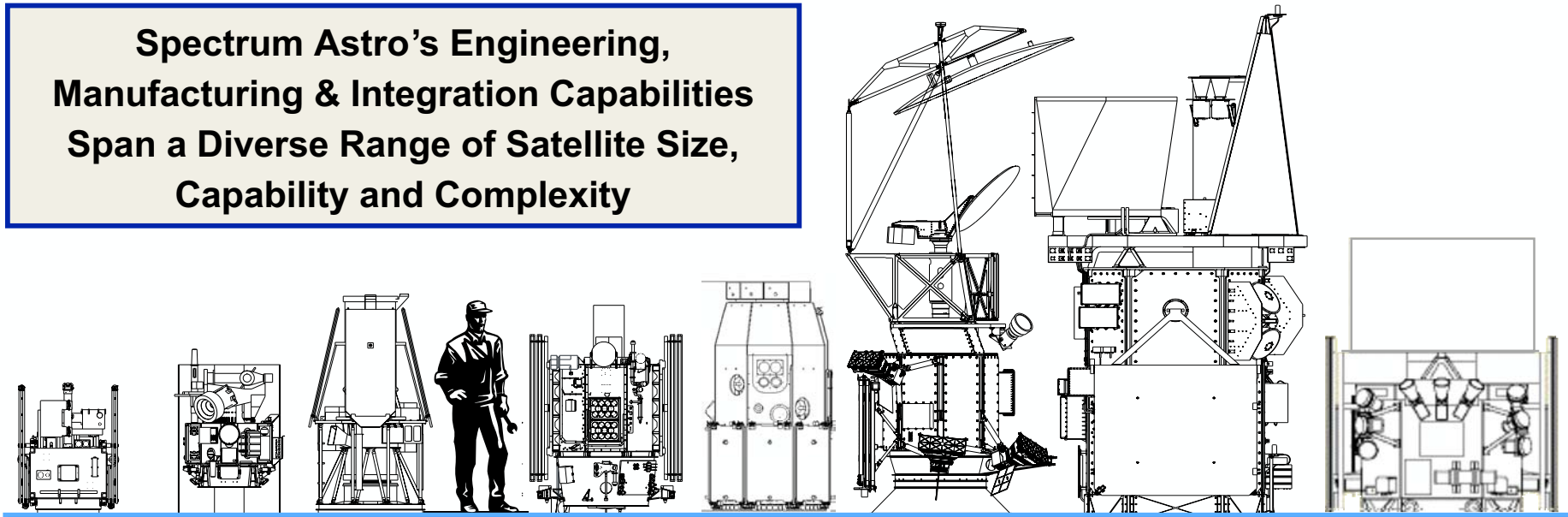
All Flight Hardware Has Been 100% Successful

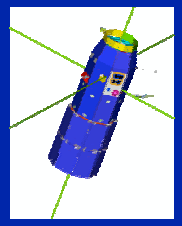
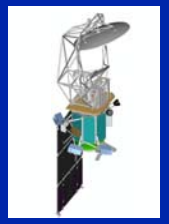
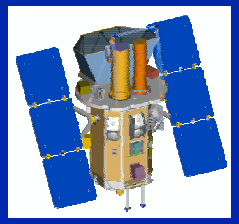
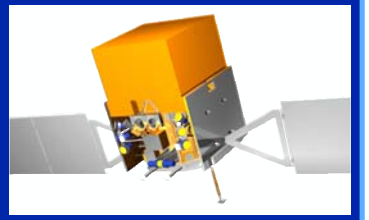
SPECTRUMASTRO

SPECTRUM ASTRO CONTINUES TO APPLY INNOVATION TO LARGER and MORE COMPLEX SATELLITES

GLAST

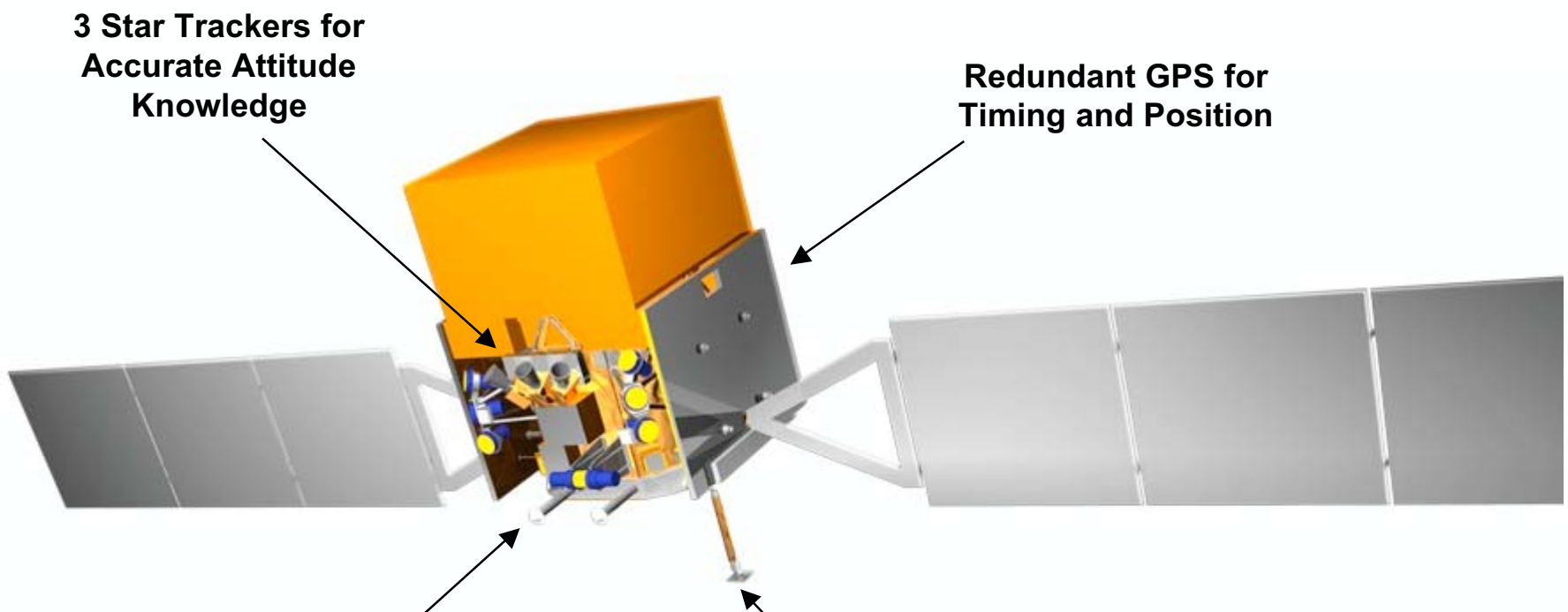
Spectrum Astro's Engineering, Manufacturing & Integration Capabilities Span a Diverse Range of Satellite Size, Capability and Complexity



MIGHTY-SAT II.1	MSTI-1,2,3	RHESSI	DEEP SPACE 1	C/NOFS	CORIOLIS	SWIFT	GLAST
	 MSTI-3						

Spectrum Astro Spacecraft Meet the Needs of Diverse Technology, Earth Science, and Space Science Missions

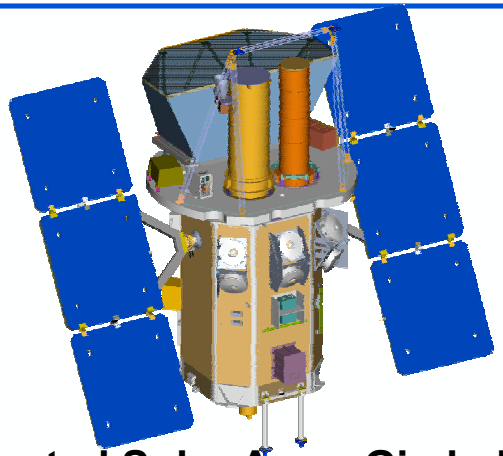
GLAST DEPLOYED CONFIGURATION



SPECTRUMASTRO

GLAST SHARES MANY FEATURES WITH OUR SWIFT DESIGN

GLAST

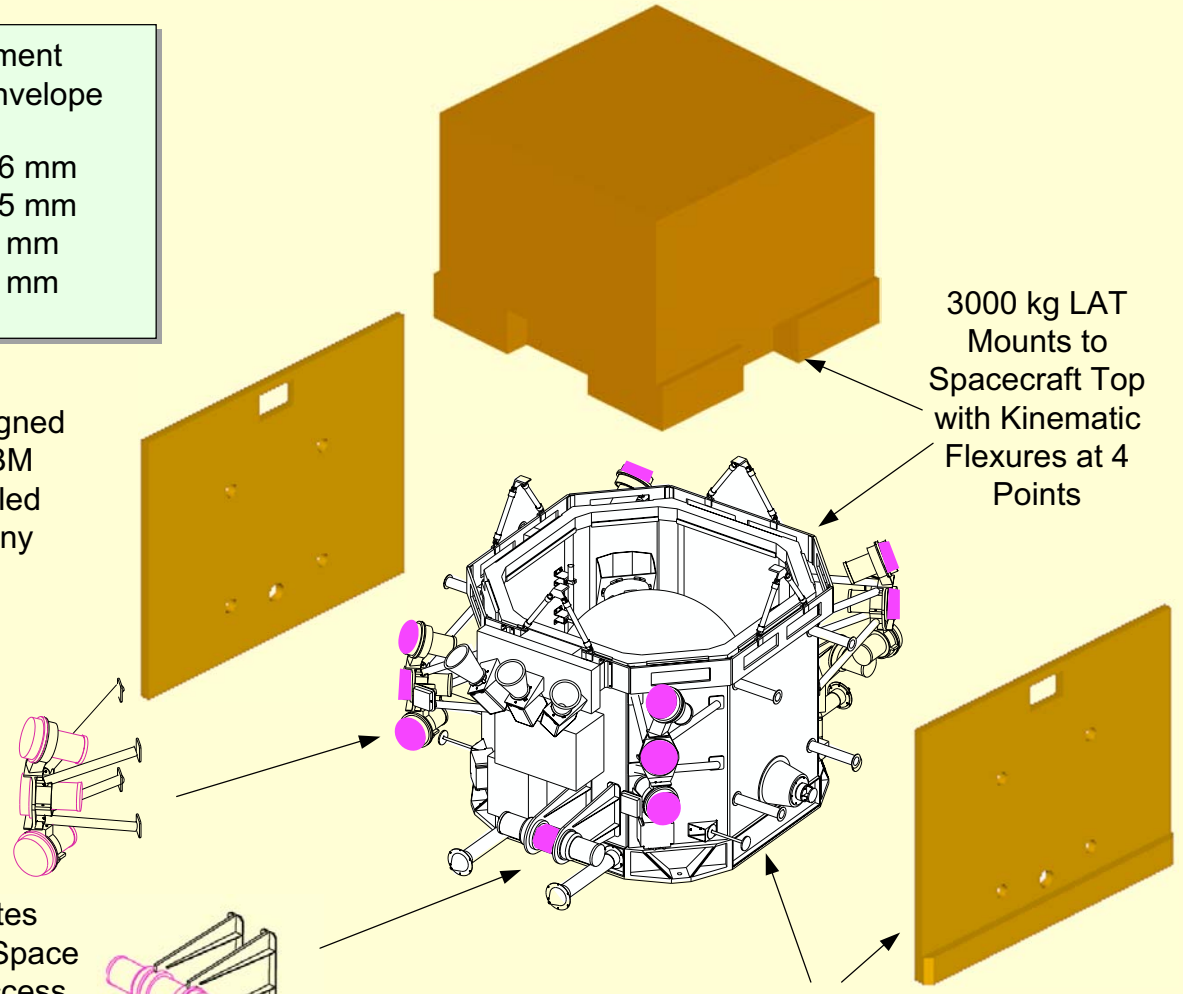


- Autonomous On-orbit Slewing Maneuvers With Coordinated Solar Array Gimbal Operation That Maintains Solar Array Pointing for Maximum Power Production
- Rapid, Autonomous Reporting of Transient Phenomena via TDRSS
- Modular Instrument Accommodation with Mechanically-Stable, Kinematic Mount Interface
- Redundant Electronics Configuration
- 2+ kW Solar Arrays
- Spacecraft Bus Mounted Instrument Radiator with Heat Pipe Connection
- Similar On-Orbit Environments (550 km @ 28.5 deg vs 600 km @ 22 deg)
- Delta Launch Vehicle with same Adapter and Separation System

LAT AND GBM ACCOMMODATION

Adequate Minimum Instrument Clearances to LV Static Envelope

LAT ACD	– 66.6 mm
LAT Radiator	– 12.5 mm
NaI Detector Crystal	– 8.9 mm
BGO Detector PMT	– 6.4 mm



3000 kg LAT Mounts to Spacecraft Top with Kinematic Flexures at 4 Points

External Placement Designed to Allow LAT or any GBM Component to be Installed Independently and in any Order

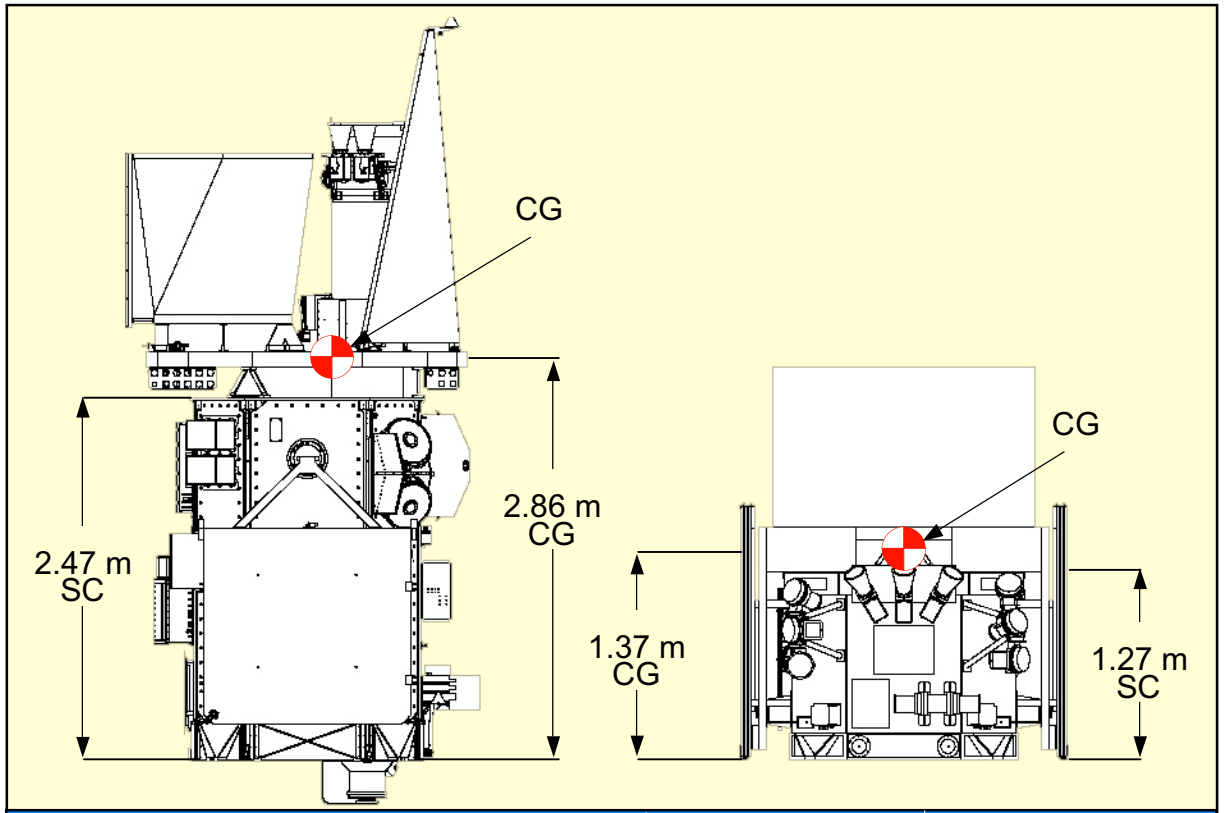
NaI Detectors Externally Mounted in 4 Sets of 3

Open Truss Accommodates Detector Radiator Views to Space and Provides Connector Access

BGO Detectors on Separate Supports Front and Back

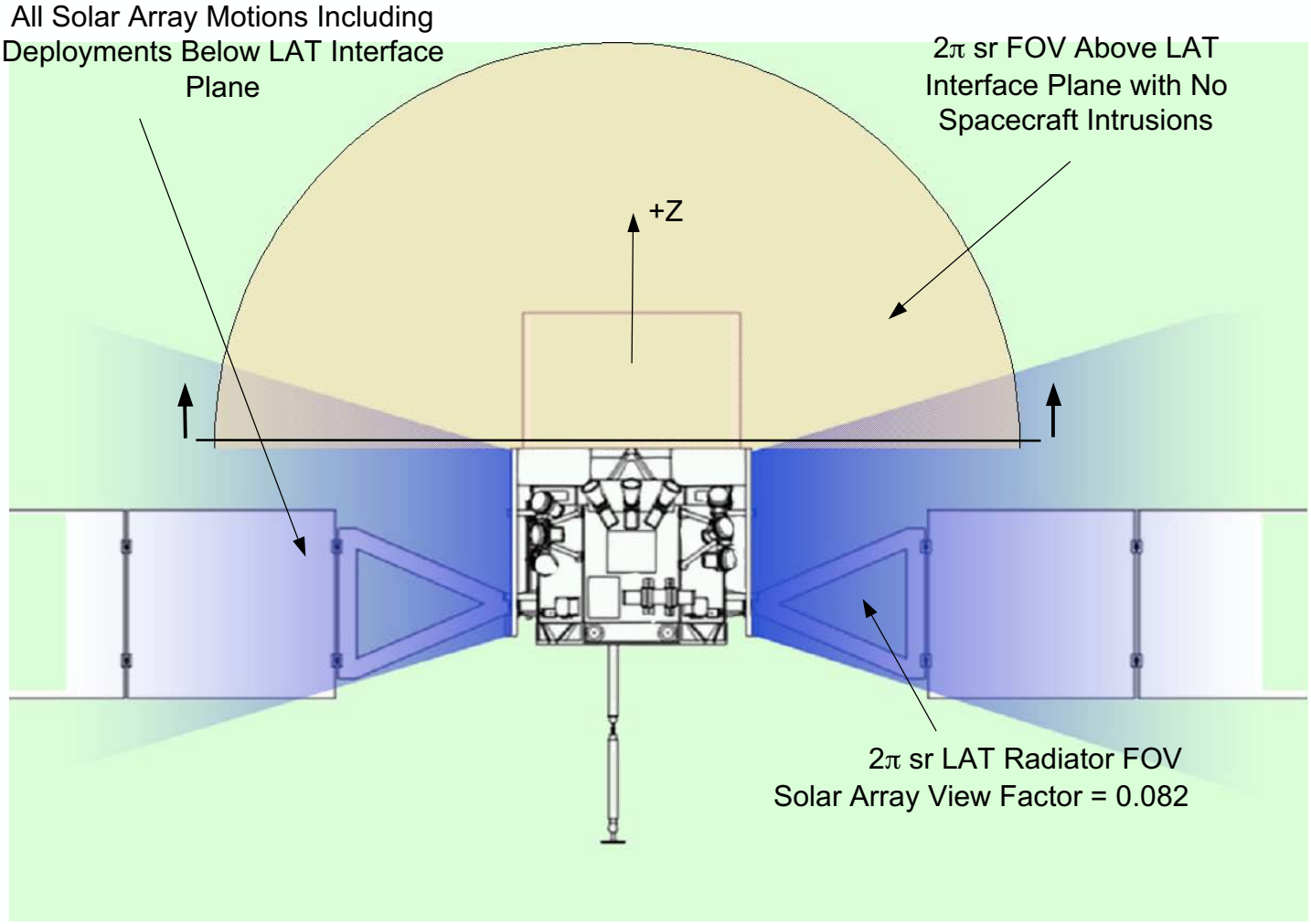
LAT Radiators Connect to Spacecraft Sides with Pinned Links

OBSERVATORY SIZE AND MASS

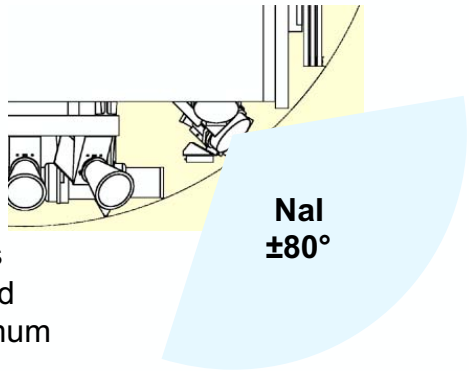


	Swift	GLAST
Instrument Mass	985 kg	3097 kg
Instrument CG from LV I/F	3.30 m	1.78 m
Observatory Mass	1455 kg	4627 kg

LAT ACCOMMODATIONS

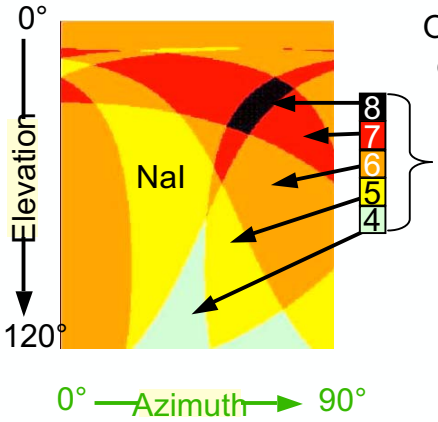


GBM ACCOMMODATIONS



Detectors Positioned for Maximum Viewing

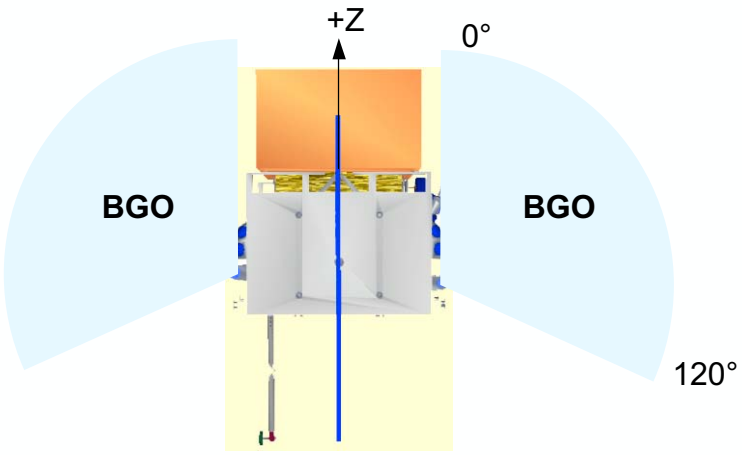
NaI Boresight Angles		
	El	Az
1	50°	0°
2	50°	180°
3	70°	45°
4	70°	135°
5	70°	225°
6	70°	315°
7	90°	0°
8	90°	60°
9	90°	120°
10	90°	180°
11	90°	240°
12	90°	300°



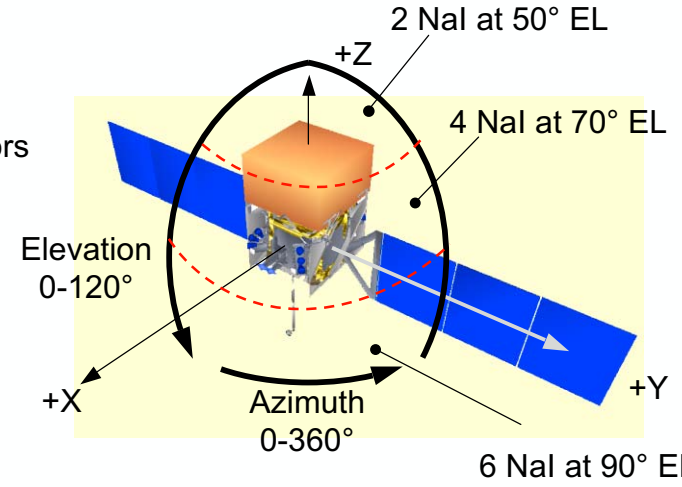
Flat Pattern Illustration of One Quadrant of Coverage

# of Sensors in View

Due to Overlap, BGO Detectors >100%



NaIs Placed to Maximize the Number of Sensors in View



SPECTRUMASTRO

CLOSING THOUGHTS

- **We Are Excited to be Part of GLAST**
- **Our Spacecraft Team Is Fully Engaged in the GLAST Design Process and Enjoying the Excellent Working Relationships with the GSFC Project Office and the instrument Teams**