



Minnesat: GPS Attitude Determination Experiment Onboard a Nanosatellite

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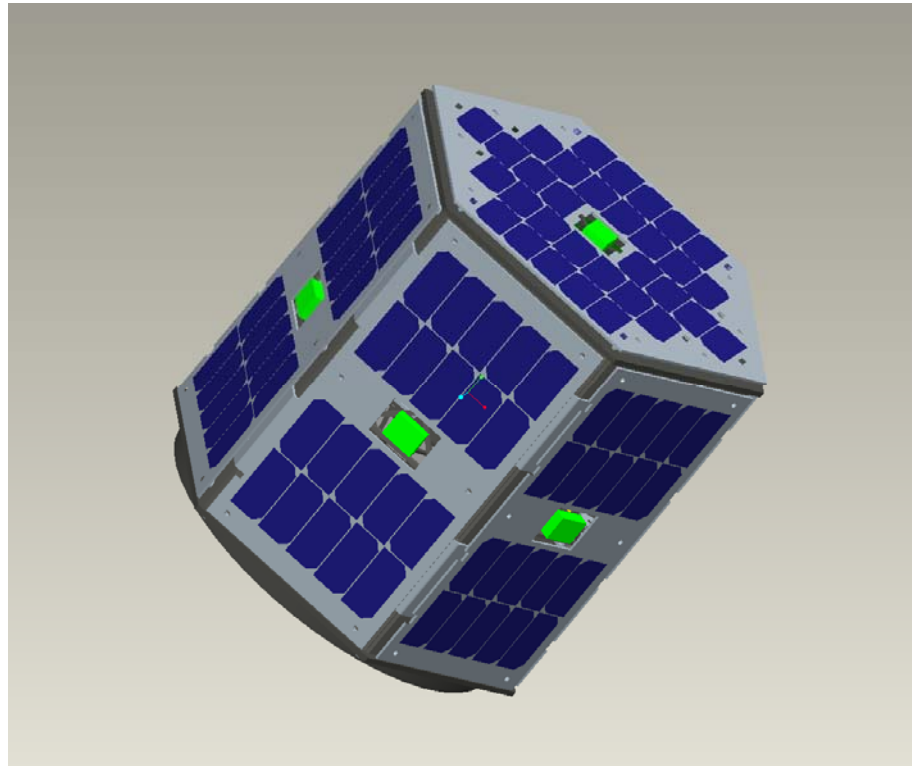
Department of Aerospace Engineering & Mechanics

UNIVERSITY OF MINNESOTA



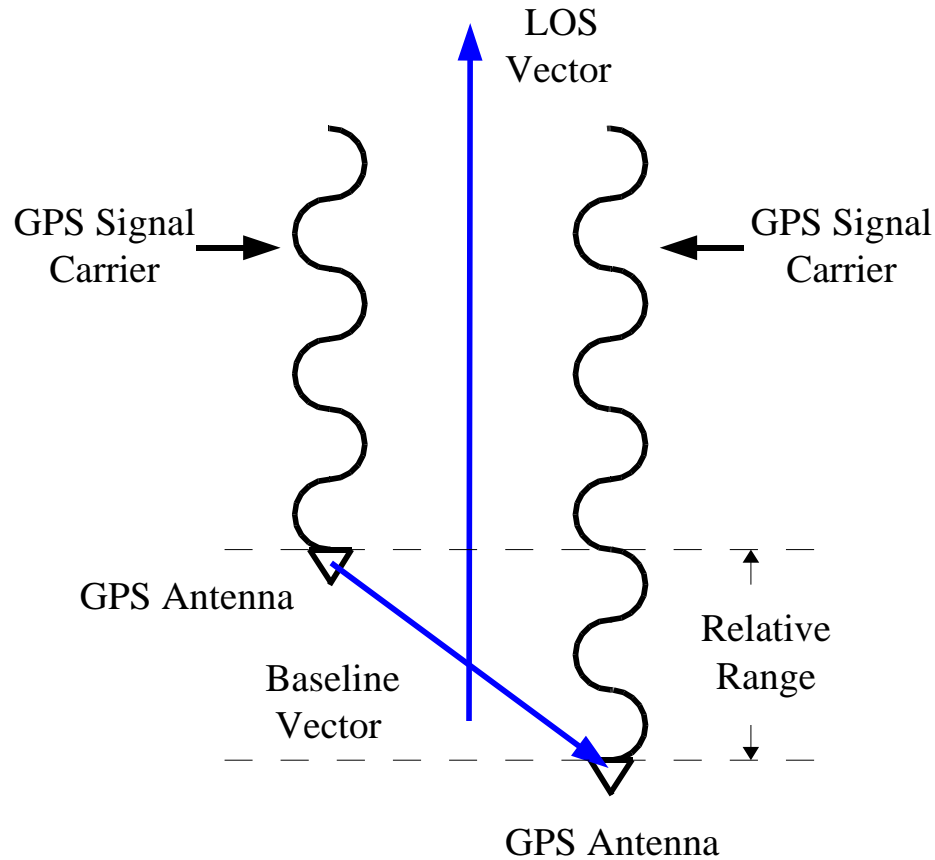
Minnesat Program

Objective: to design and evaluate the performance of an ultra-short baseline GPS attitude determination system





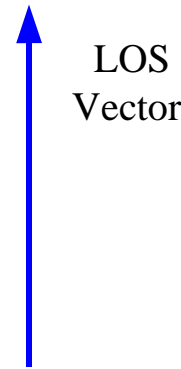
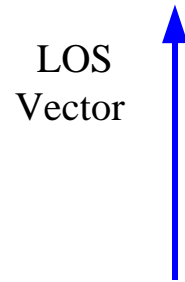
GPS Attitude Determination



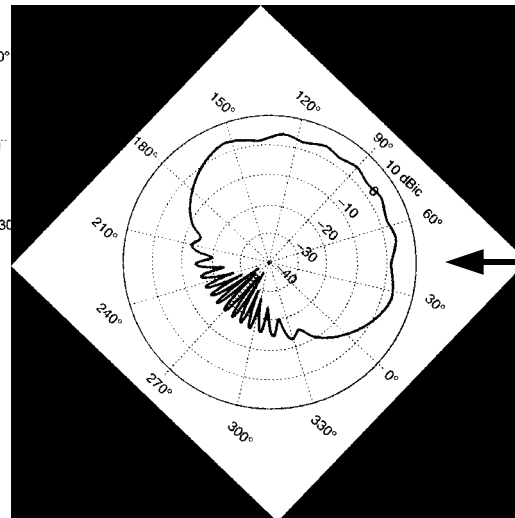
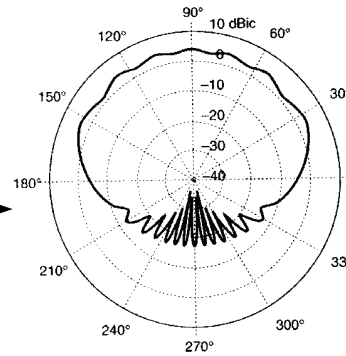


GPS Antenna Gain Patterns

GPS
Satellite



Antenna
Gain
Pattern

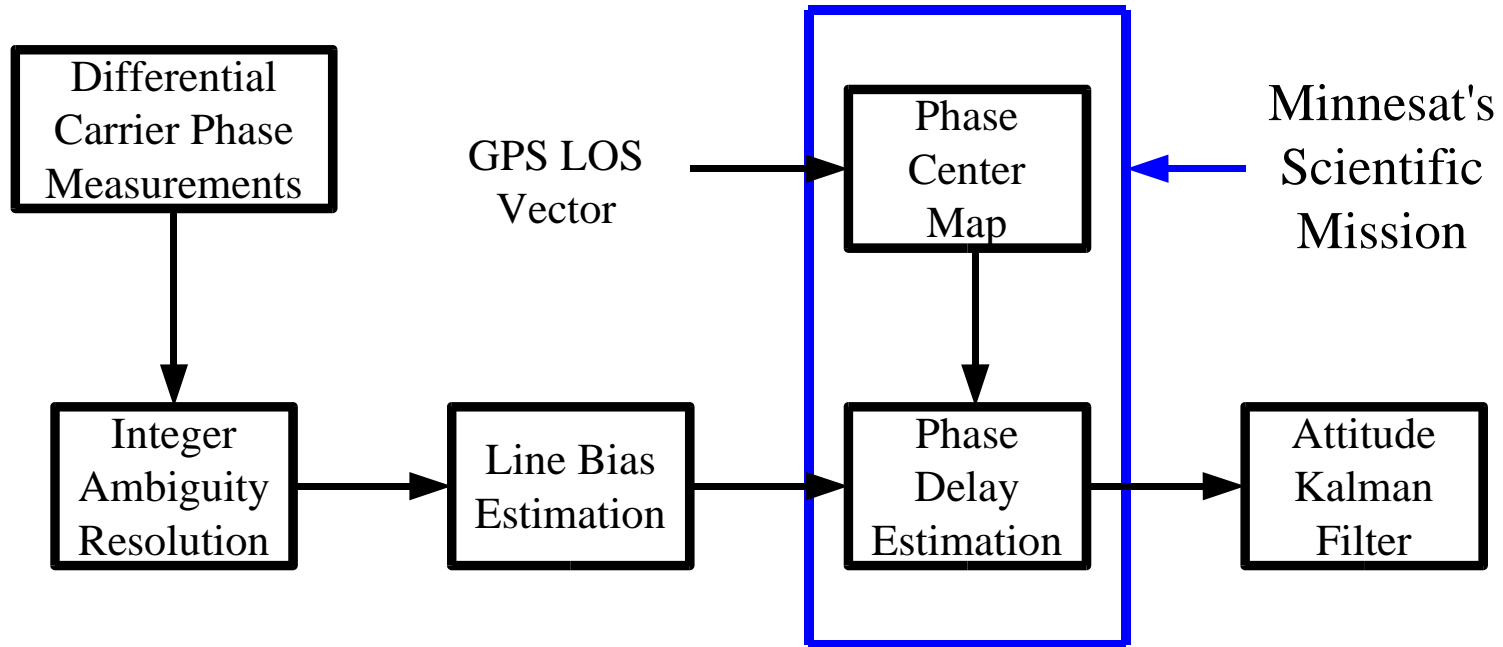


Antenna
Gain
Pattern





Carrier Phase Calibration

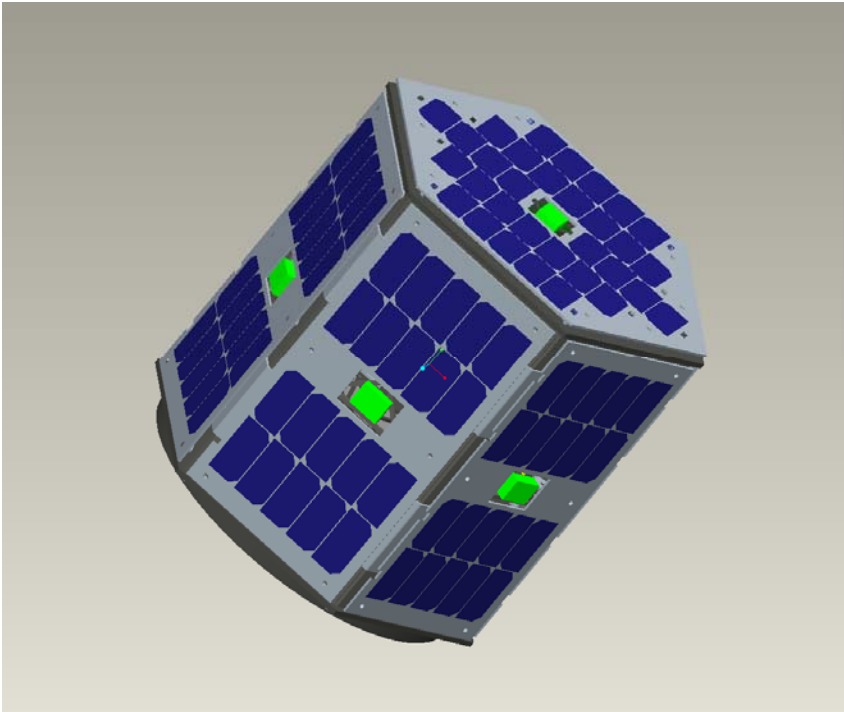


Attitude Errors, without phase delay estimation: $2^\circ - 5^\circ$

Attitude Errors, with phase delay estimation: $< 1^\circ$



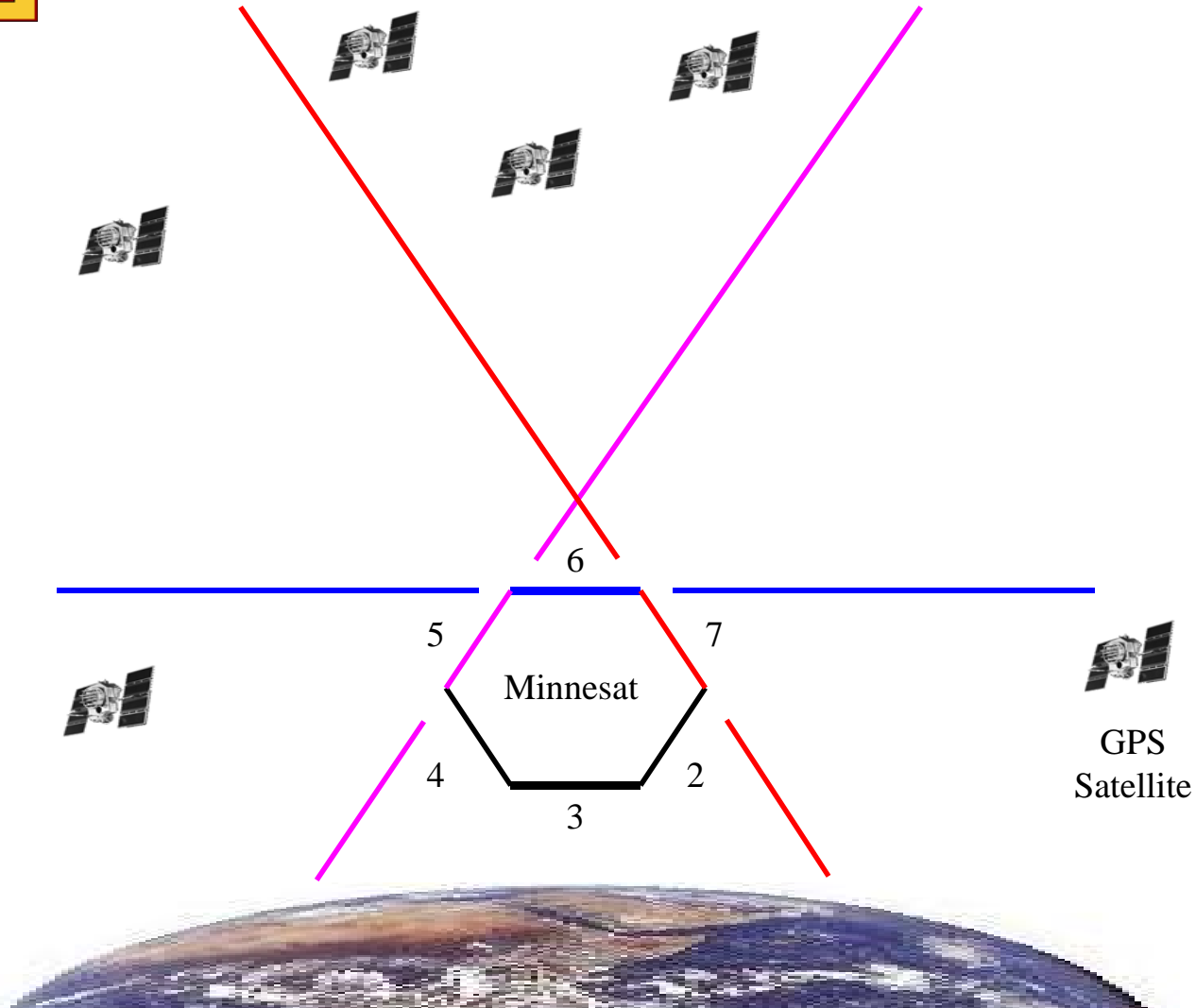
General Design



- 8 GPS sensors
- Axi-symmetric hexagonal frame
- Physical Dimensions
 - circumscribed radius: 22.5 cm
 - height: 45 cm
 - mass: < 30 kg
- Dynamically Stable

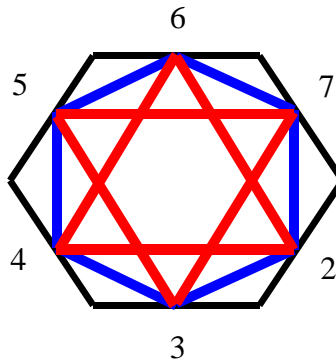
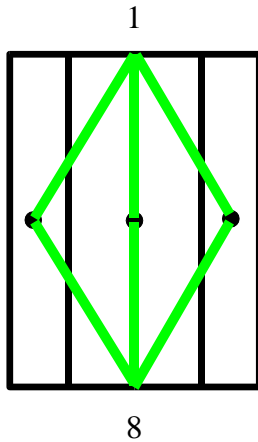


GPS Antenna Configuration





GPS Antenna Baselines

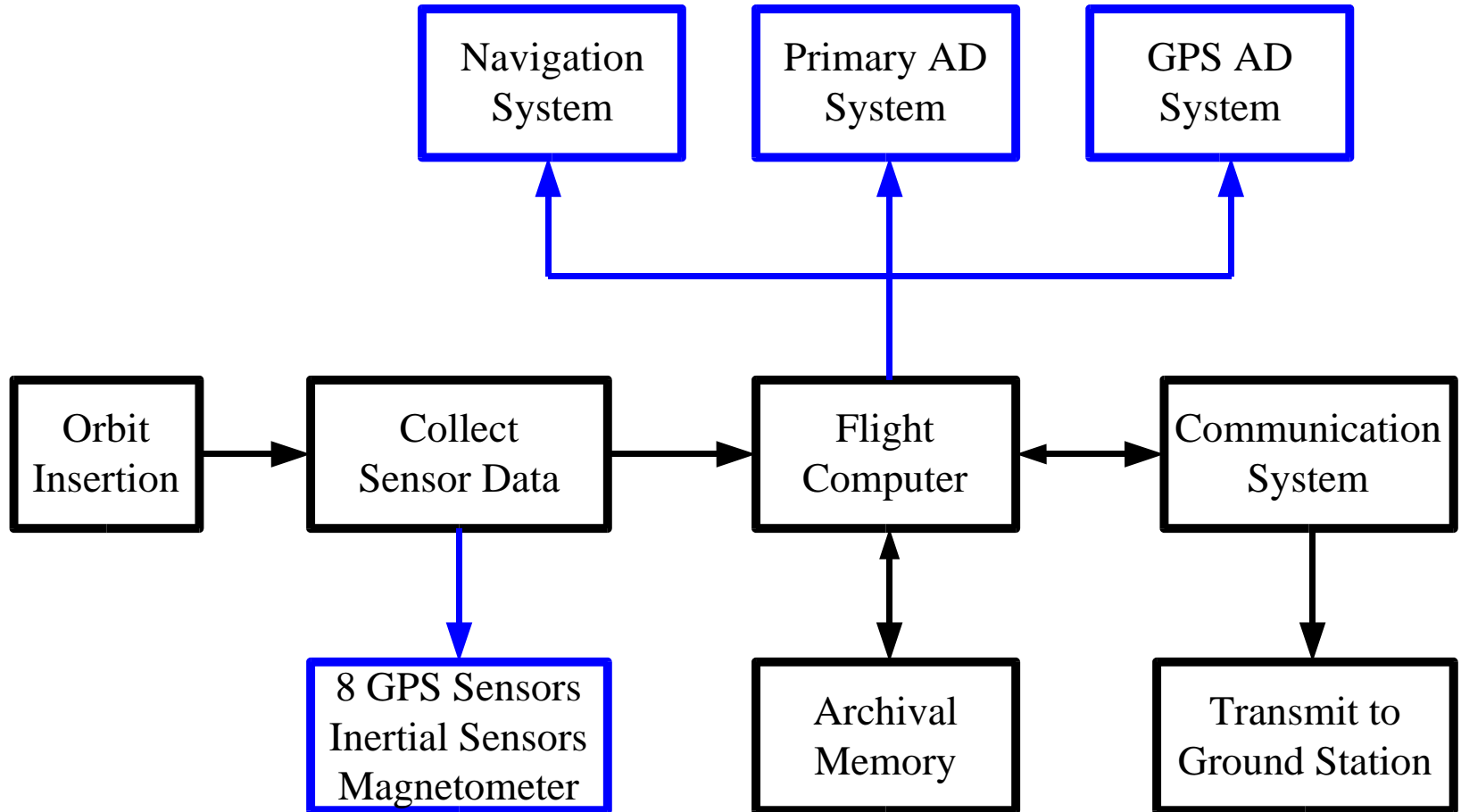


24 Antenna Baselines

- 19.5 cm
- 31.8 cm
- 33.8 cm



System Overview





Acknowledgments

AFRL University Nanosatellite Program Office

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Industrial Partners

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