

2009 IEEE International Symposium on Geoscience and Remote Sensing (IGARSS 2009)

National Polar-orbiting Operational Environmental Satellite System's Key to Low Data Latency: SafetyNet™

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Abstract

A key feature of the National Polar-orbiting Operational Environmental Satellite System is the Northrop Grumman Space Technology patented data collection architecture known as 'SafetyNet™'. The centerpiece of SafetyNet™ is the system of fifteen globally-distributed ground receptors in development by Raytheon Company. These receptors or antennae will collect up to five times as much environmental data approximately four times faster than current United States' polar-orbiting weather satellites. Once collected, these data will be forwarded near-instantaneously to United States weather centrals via global fiber optic network for processing and production of data records for use in environmental prediction models.

Key system design factors of the National Polar-orbiting Operational Environmental Satellite System SafetyNet™ architecture provide: (1) Frequent data downlinks and maximizes satellite contact duration (greater than 100% margin) at low cost, (2) Downlink bandwidth margin that allows for all Stored Mission Data to be down linked to two separate receptors and (3) Minimal latency impacts from any loss of multiple ground receptors.

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Other notable characteristics of the National Polar-orbiting Operational Environmental Satellite System SafetyNet™ ground system architecture include: (1) A simple, receive-only, Ka Band receptor design that provides autonomous operations, (2) Fifteen receptor locations in ten countries (one of which is South Africa), (3) Full-motion receptor/antenna to track polar satellites, (4) Reliable and timely collection, delivery and processing of high quality data, and (4) 75% of the National Polar-orbiting Operational Environmental Satellite System data products delivered to the United States' weather centrals within fifteen minutes, and the rest in under thirty minutes, from the time data are sensed.

The paper/presentation will also show several relevant graphics, charts, graphs and photographs, such as:

- A graphic of SafetyNet™ within the overall National Polar-orbiting Operational Environmental Satellite System program architecture,
- A depiction of the National Polar-orbiting Operational Environmental Satellite System data download scheme,
- A Mercator map of the worldwide SafetyNet™ receptor locations,
- A graph of the percent of National Polar-orbiting Operational Environmental Satellite System Environmental Data Records (EDRs) versus time from observation to delivery,
- A example chart of the National Polar-orbiting Operational Environmental Satellite System data downlink patterns to SafetyNet™ receptors, and
- Example photos of SafetyNet™ receptor antennae and radomes.

Additionally, all components of a National Polar-orbiting Operational Environmental Satellite System SafetyNet™ facility will be located to avoid significant impacts on the following environmental resources: Land Use, Wilderness Areas, Natural National Landmarks, Water Resources, Geology and Mineral Resources, Flood Hazard, Biological Resources, Air Quality, Cultural and Historic Resources, Farmlands, Solid and Hazardous Waste, Noise, Visual/Scenic Resources and Minority/Low-Income Populations

The SafetyNet™ ground system is a key element of the National Polar-orbiting Operational Environmental Satellite System's capability to provide reliable and timely collection, delivery, and processing of quality environmental data and contributes significantly to the expected 99.95 percent data availability.