

GSFC Annual Review

SOMO Technology Program

September 19, 2001

Lisa Callahan/500

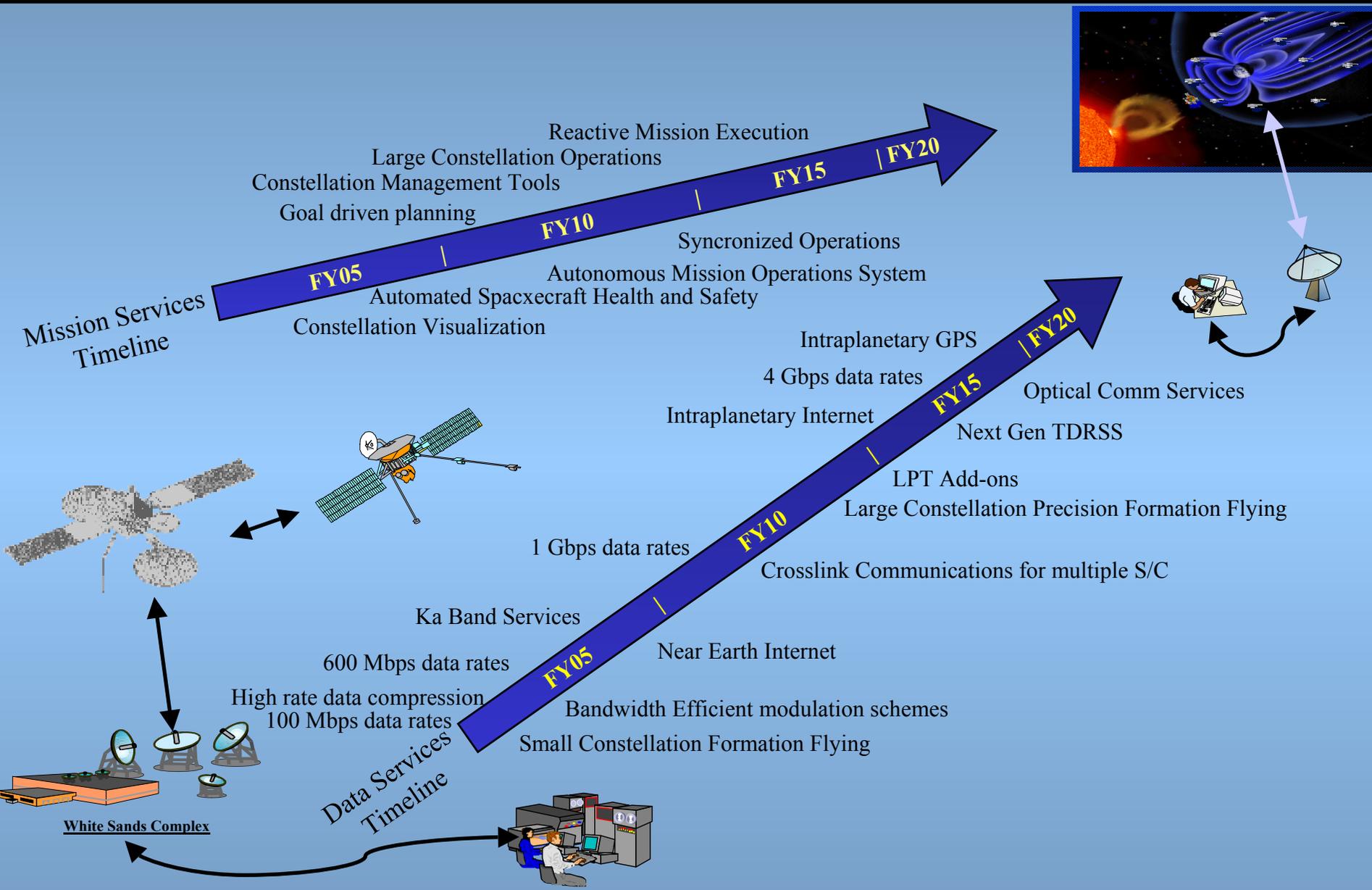
Vicki Oxenham/500

SOMO Program Objectives

To identify, develop, integrate, validate and transfer advanced technologies that will increase the performance and reduce costs of Mission Operations to SOMO and its customers

Develop multi-mission technology to enable Earth Science, Space Science, HEDS, and Space Transportation Enterprise future mission objectives.

GSFC Space Operations Technology Development Strategic Roadmap



Search and Rescue Technology Insertion (SRTI) FY01 Work Area 5620 Roadmap

GODDARD SPACE FLIGHT CENTER

Objective

Use aerospace technology to save more lives, decrease rescue costs, and reduce the risks to search personnel by improving the speed and effectiveness of distress alerting, search, and rescue operations.

Products

Technical support to NOAA, Search & Rescue operational agencies, and industry.

Development and prototyping of Self-Locating and Micro-Personal Locator Beacons.

Innovation and development of new techniques for remote disaster sensing, including Synthetic Aperture Radar and Laser Scanners.

Development of advanced satellite-aided Global Personnel Recovery System (GPRS) using GPS-borne SARSAT 406 MHz Repeaters with message reception verification return links.

Development of potential GPRS Partnership with Earth Alert - Hazard Warning System.

3.1 GPS/S&R Repeater Performance Analysis and Ground Station Study completed.

2.4 Evaluation/Report of LSAR Real-Time Functions.
2.5 Demo of SAR² processing gains.

2.1 SAR² Radar Field Experiments.
2.2 SAR² Report on Operations Procedures.

2.3 SAR² Report on SAR Radar Frequencies Development Strategy



Note: Milestone Numbers Refer to Specific Deliverables in the FY01 5620 S&RTI Work Area Plan

Advanced Range Technology Initiative (ARTI)

FY01 Work Area 5640 Roadmap

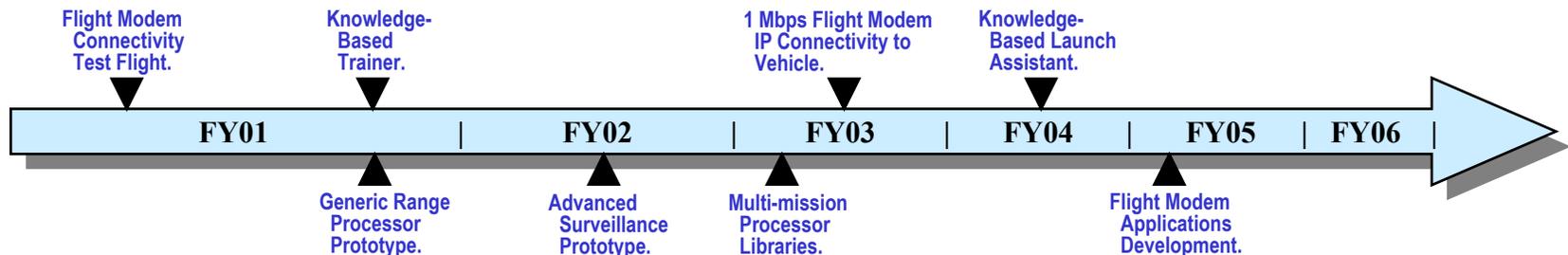
GODDARD SPACE FLIGHT CENTER

Objective

- To enhance access to space by reducing launch costs and increasing range mission capacity, safety, and reliability by advancing the state of the art in Launch Range Technologies, their testing, and deployment.

Products

- Development of a Flight Modem to allow infrastructure-less command and control connectivity to in-flight launch vehicles.
- Knowledge Capture, Engineering, and Modeling of Launch Mission Management expertise.
- Development of an Aircraft, Balloon, and Launch Vehicle Technology test bed at the Wallops Test Range.
- Development of a Highly Flexible, Distributed Virtual Launch Facility and Control Center.
- Development and deployment of a Mobile, Modular, Configurable Range Processor.
- Demonstration of low-cost, advanced surveillance technologies in support of launch activities.



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Note: Milestone Numbers Refer to Specific Deliverables Listed in the FY01 5640 ARTI Work Area Plan

Signed: _____ [Work Area Manager] Date: _____

Advanced Modulation, Coding, Processing and Compression

FY01 Work Area 5610 Roadmap

GODDARD SPACE FLIGHT CENTER

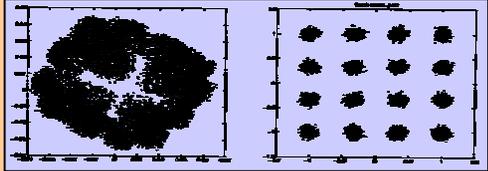
Objective

- To enhance mission science capability while reducing operations cost through advancing the state of the art in the mission critical areas of **Advanced Modulation, Coding, Processing and Compression**.

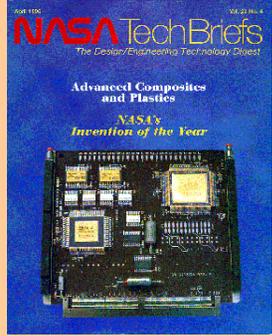
Products

- Bandwidth efficient Turbo Codes, high-rate (600 Mbps) Viterbi decoder, high performance (40:1) data compressor (HPDC), reconfigurable data path processor (RDPP), VLSI CCSDS gateways.
- Analysis/development of high-order modulation techniques (e.g., 8-ary PSK/16-QAM, TCM) and adaptive equalization techniques.
- Development/support of a space communication protocol testbed (Space-to-ground link simulator).
- Development of full duplex low power optical communication system; collaboration with AF on 10 Gbps system.
- Development of 600 Msp/s digital receiver, 1.2 Gbps data processing system with frame synch, RS and packet processing.

Advanced Modulation, Coding, Processing and Compression Work Area



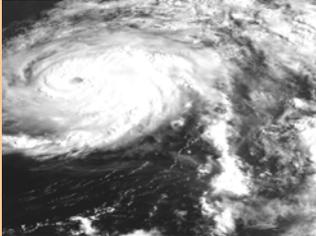
Bandwidth Efficient Modulation and Coding



Lossless Data Compression

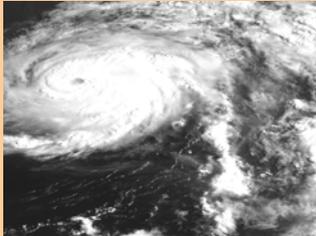


600 Mbp's Digital Receiver

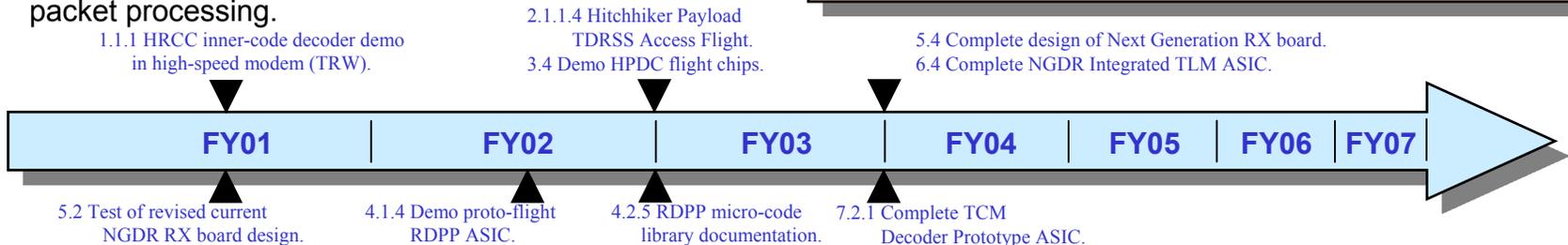


Reconstructed

Compress
20:1



Original



Note: Milestone Numbers Refer to Specific Deliverables in the FY01 5610 AMPCP Work Area Plan

End-to-End Mission Autonomy (EEMA)

FY01 Work Area 5830 Roadmap

GODDARD SPACE FLIGHT CENTER

Overall Objective

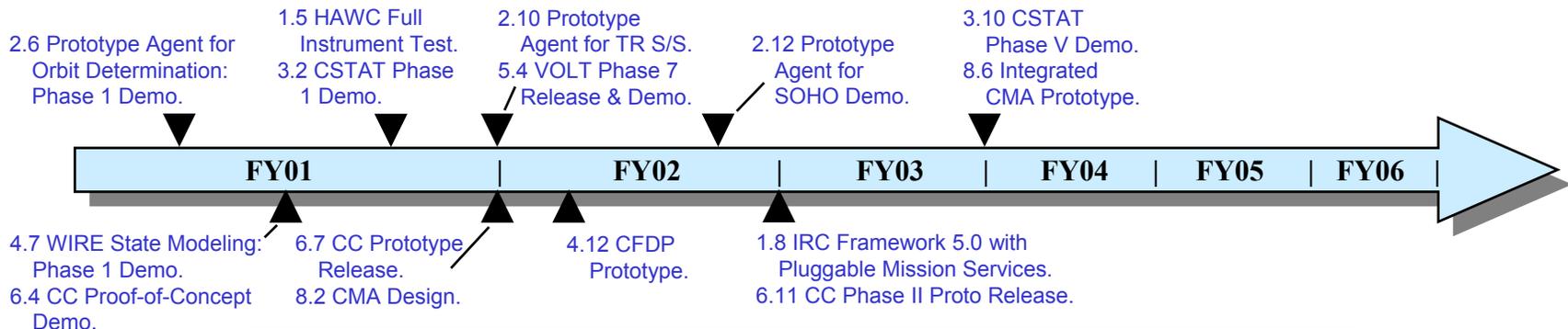
- Enable science collection and constellation management through transparent, autonomous mission operations.

Products

- Cross-platform framework for automated remote instrument configuration, control, monitoring and analysis.
- Architectures and technologies for advanced mission autonomy and constellation management.
- Advanced FDIR, trend analysis and goal-oriented planning for autonomous systems.
- Collaborative planning tools for coordinated observations with heterogeneous, distributed observatories.



Automated Operations for Constellations



Note: Milestone Numbers Refer to Specific Deliverables Listed in the FY01 5830 EEMA Work Area Plan

User Tools for Autonomous Systems (UTAS)

FY01 Work Area 5820 Roadmap

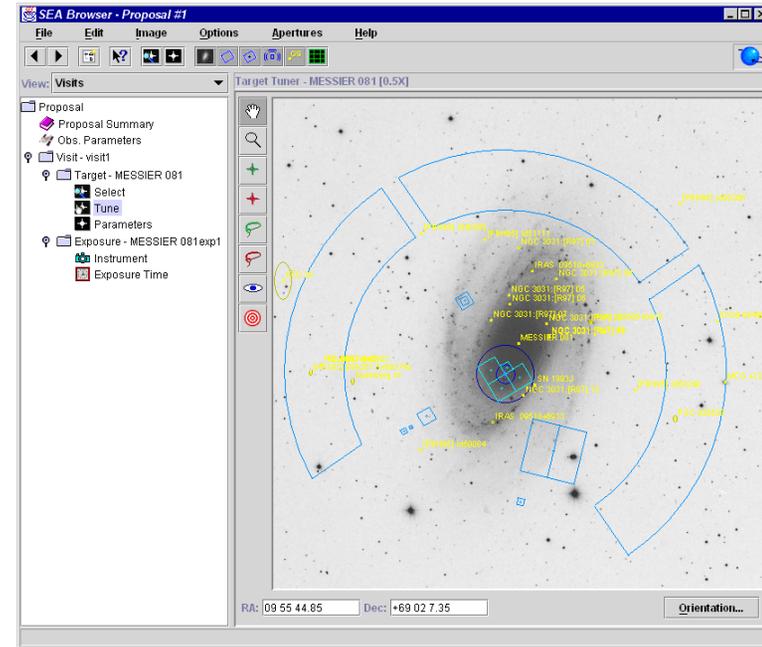
GODDARD SPACE FLIGHT CENTER

Overall Objective

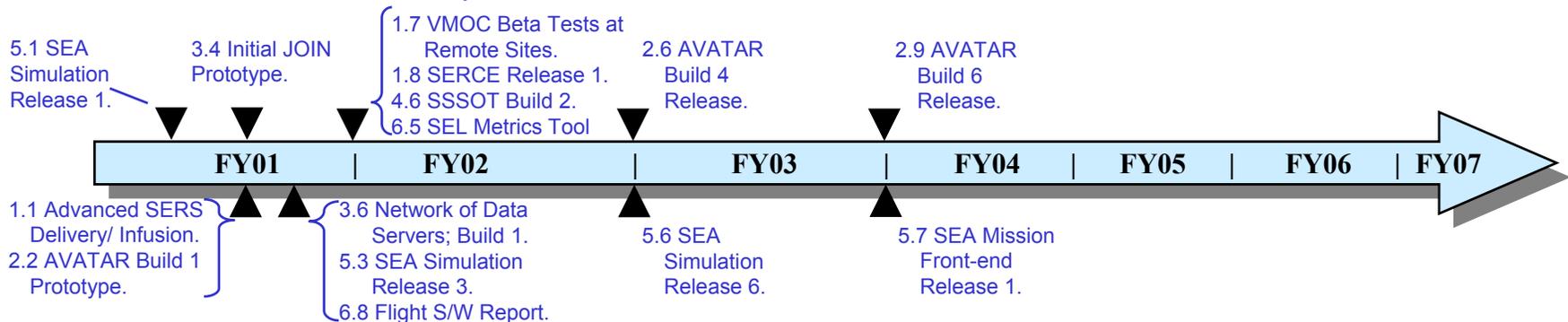
- Identify, develop and infuse user interface tools and technologies to enable autonomous operations techniques to plan, operate and visualize activities from remote locations.

Products

- Advanced visual tools to enable science planning and observation specification supporting mission autonomy.
- High fidelity 3D visualization tools on low-end computers for spacecraft and constellation management.
- Operational system prototypes to enable remote contact and quick analysis and response for on-call ops staff.
- Intelligent software assistants to help scientists and mission teams formulate and develop advanced missions.



Scientist's Expert Assistant User Interface



Note: Milestone Numbers Refer to Specific Deliverables in the FY01 5820 UTAS Work Area Plan

Spacecraft as an Internet Node (SIN)

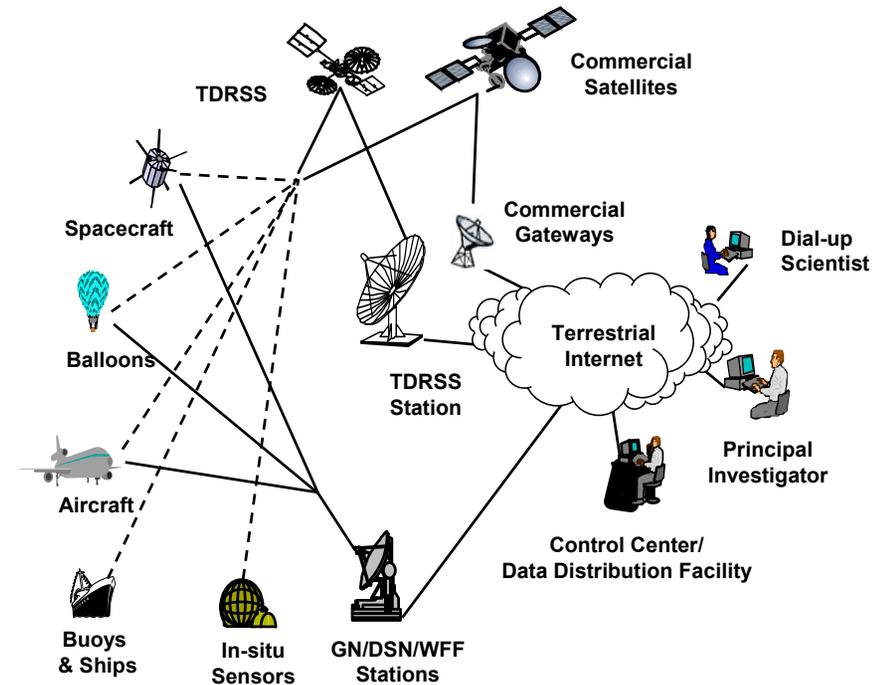
FY01 Work Area 5810 Roadmap

Objective

- Investigate, develop, test, and demonstrate Internet technologies that enable Space Operations vision for transparent operations for earth and space science missions.

Products

- Full IP mission Lab - Flatsat
- Flight Demonstration of IP operations concepts using UOSAT-12, including TCP/IP, UDP, Web servers, E-Mail
- Development of flight qualified network hardware supporting TCP/IP protocol stacks
- CFDP Reliable file transfer library interfaced to TCP/IP and UDP
- Security studies and demonstrations
- Engineering support for infusion of IP technologies into the first IP mission.



1.1.1 Initial FlatSat Testbed Implementation Report.

4.1 Three Ops Concepts for Operating S/C as Internet Nodes.

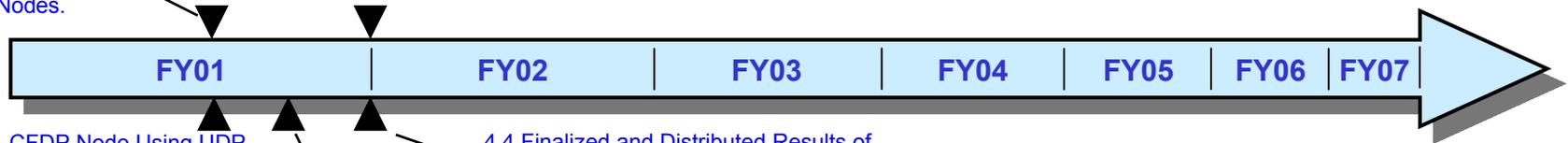
2.3 SpaceLan FlatSat Delivery.

2.5 OMNI Phase 3 FlatSat Demonstrations.

5.1 CFDP Node Using UDP.
6.1 Final STRV Flight Protocol Experiment Test Plan.

1.2.4 UoSat-12/SNAP Mobile IP Experiments Report.

4.4 Finalized and Distributed Results of Risk/Security Study.
6.3 Final STRV Flight Protocol Experiment Engineering and Test Results.



Note: Milestone Numbers Refer to Specific Deliverables in the FY01 5810 SIN Work Area Plan.

Advanced Space and Ground Network (ASGN) FY01 Work Area 5630 Roadmap

GODDARD SPACE FLIGHT CENTER

4th Generation Transponder with Ku-band Exciter, Ku-band-to-Ka-band Upconverter and Ka-band Phased Array

Objective

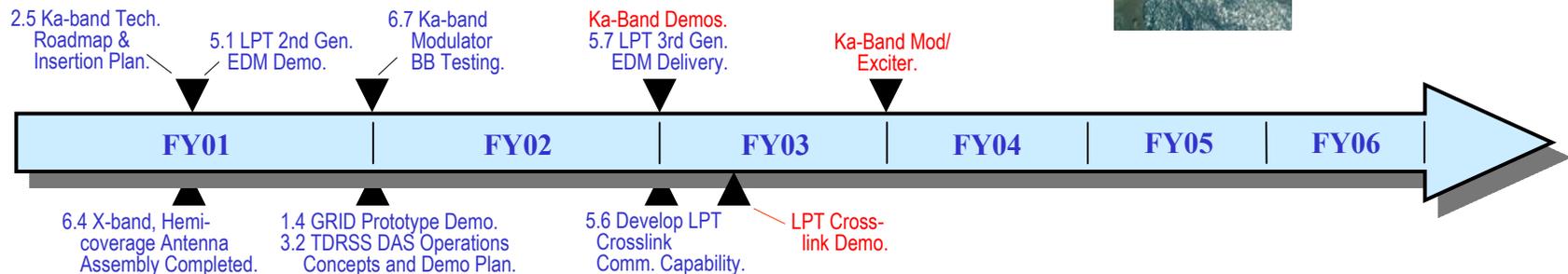
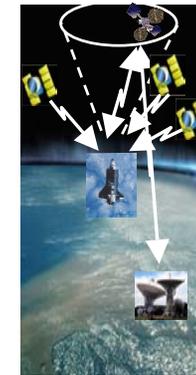
- To enhance mission science capability while reducing operations cost through advancing the state of the art in the mission critical area of Advanced Space and Ground Networks.



Products

- Development and prototyping of new Ka-band operations concepts and related technologies for NASA missions.
- Development of a low-power, TDRSS user transceiver (LPT) featuring simultaneous GPS-based onboard navigation and Space Network & Ground Network communications.

CANDOS Hitchhiker Experiment Demonstrating the Low Power Transceiver (LPT)



Note: Milestone Numbers Refer to Specific Deliverables in the FY01 5630 ASGN Work Area Plan.

Signed: _____ [Work Area Manager] Date: _____

Flight Dynamics Technologies (FDT)

FY01 Work Area 5710 Roadmap

GODDARD SPACE FLIGHT CENTER

Objective

- Extend autonomous maneuver decision making, planning and execution techniques to enable distributed networks of individual vehicles to act collaboratively as a single functional unit.
- Develop techniques to support autonomous navigation and onboard navigation systems.

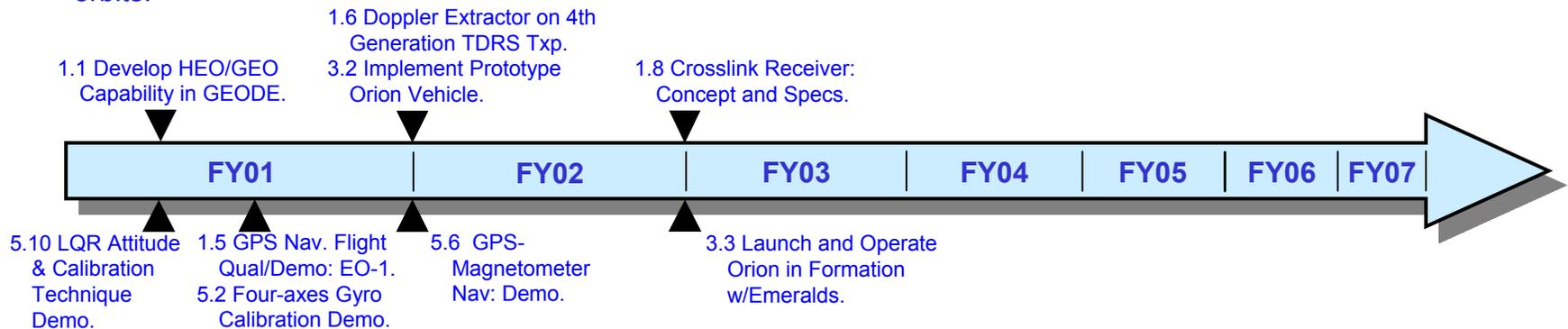
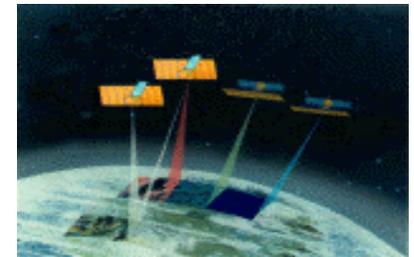
Autonomous Constellation Control



Products

- Automated measurement and control systems to establish and maintain configuration and orientation of formation flying networks.
- Trajectory and orbit calculation tools and visualization techniques.
- Onboard cross-link receiver.
- Techniques for advanced attitude determination & sensor calibration.
- Onboard navigation user receiver.
- GPS-based techniques to support autonomous navigation.
- Techniques for autonomous navigation for high earth, libration, & gravity assist orbits.

Global Coverage



Note: Milestone Numbers Refer to Specific Deliverables in the FY01 5710 FDT Work Area Plan.

SOMO Status

- As of October 1, 2001 SOMO will be dissolved.
- A new decentralized infrastructure has been formed which depends upon the Enterprises to manage NASA resources and implement formerly SOMO-led programs
- GSFC will continue to develop technology for data as well as mission services in response to customer requirements

CTP FY02 Content

New/Changed

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