



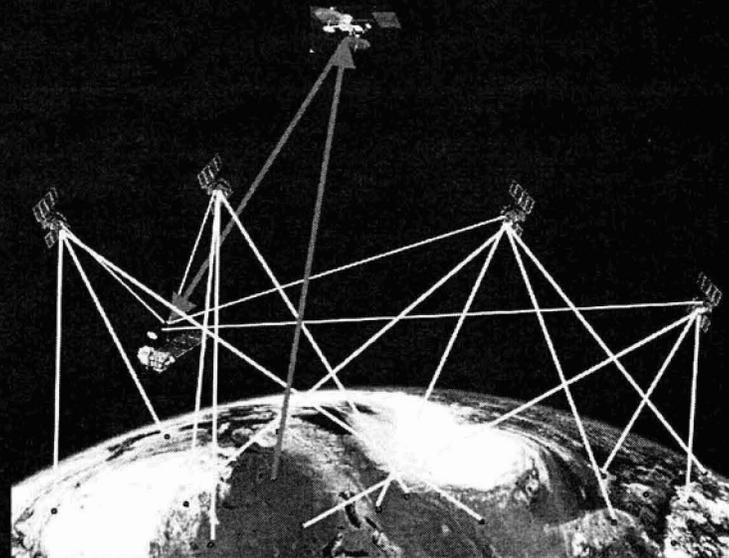
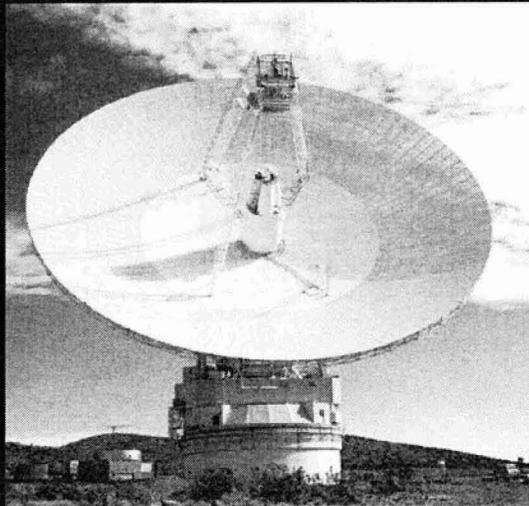
Division 33: Communications, Tracking & Radar



Telecommunications Division Overview

*Kent Kellogg, Manager
Stephen Lichten, Deputy Manager*

*70m Deep Space Network
antenna at Goldstone, CA*



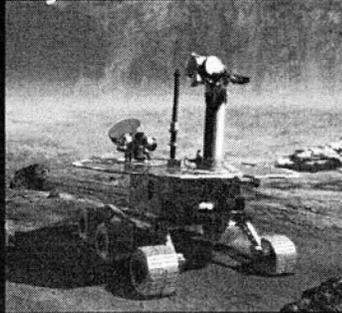
*Real-time Global Differential GPS
high precision operational system*



*Cassini spacecraft with 4m
multi-function high gain
antenna in thermal vacuum
testing at JPL*

Provides Key Competencies for Space Exploration

In-situ & proximity relay communications



Autonomous mobility

Communication architectures



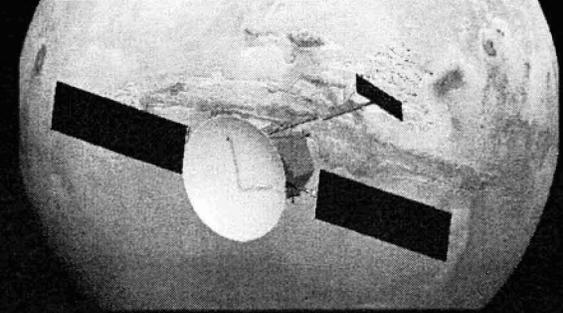
End-to-end system engineering

Reliable, high performance communications & radio science



Deep space communications

High accuracy radiometric tracking for science and planetary navigation



Deep space navigation and highly stable clocks

Precision formation flying sensors & distributed spacecraft communications



Extreme precision formation flying for science & rendezvous



High precision spaceborne systems, optical-sub-millimeter, & interferometry



Active sensors for mapping and positioning (SAR, altimeters, GPS)

Key areas critical to space exploration
(from JPL Director's April 2004 JPL Overview Package)

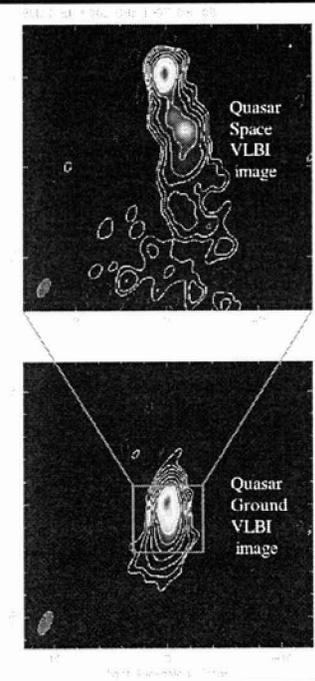
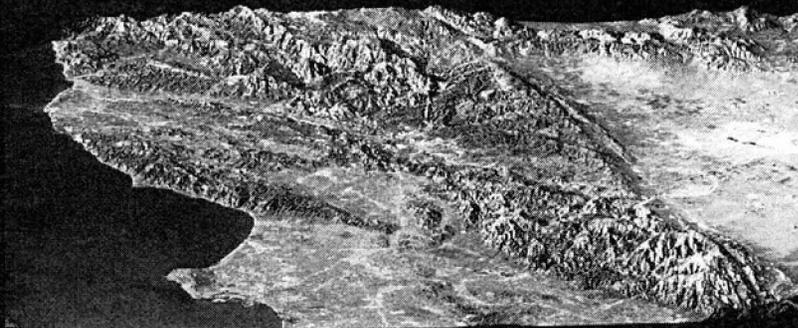
Division scientists conduct synergistic research

Space Science

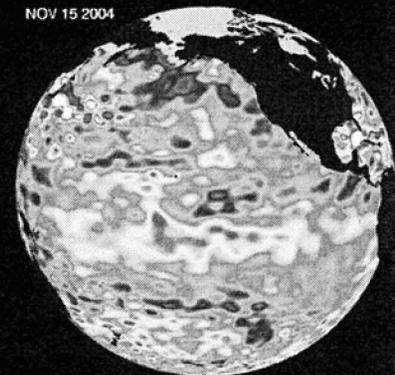
- Characterizing body mass, motion
- Occultation studies (atmospheric composition)
- Pioneer anomaly
- Gravitational waves
- Radio Astronomy and Astrophysics

Earth Science

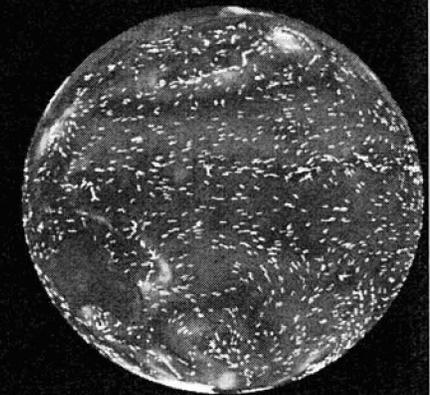
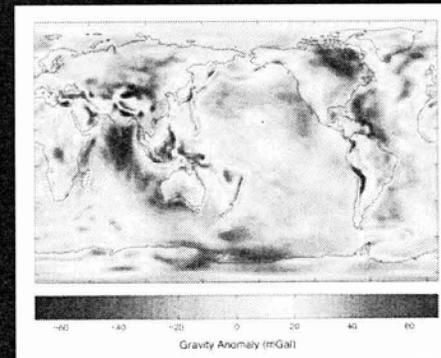
Earth Energy Balance (CloudSAT, TRMM)



Astrophysics of Black Holes



Physical Oceanography



Tectonic motion, seismic detection (SRTM) Time-variable gravity (GRACE)



Division 33: Communications, Tracking & Radar



Telecommunications Division (33)

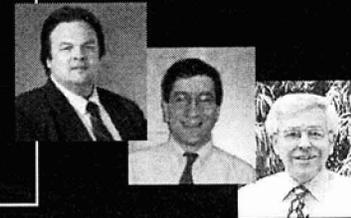
Kent Kellogg, Manager

Steve Lichten, Deputy Manager

Sam Zingales, Assistant Manager

Richard Horttor, Chief Telecom System Engineer

Joe Yuen, Division Technologist



Red shows organizational changes in August 2004

International GPS Service Central Bureau
 Ruth Neilan, Manager
 Angelyn Moore, Deputy Mgr



Communications Architectures & Research (332)



Fabrizio Pollara, Manager
 Polly Estabrook, Deputy Mgr

- Spectrum Engineering
- Protocols, Coding & Data Compression
- Digital Signal Processing Research & Development
- Optical Communications
- Radio Science & DSN Planetary Radar
-

Communications Ground Systems (333)



Dan Rascoe, Manager
 Jean Patterson, Deputy Mgr

- Ground Comm System Engineering
- Antenna RF & Microwave Engineering
- Antenna Mechanical & Structural Engineering
- Cryogenic RF Electronics
- Antenna Control
- Exciters and High Power Transmitters
- Signal Processing Systems

Radar Science & Engineering (334)



Soren Madsen, Manager
 Wendy Edelstein, Deputy Mgr
 Paul Rosen, Assistant Mgr

- Radar System Engineering for Aircraft & Space Use
- Interferometric SAR
- Altimeters, Sounders & Scatterometers
- Atmospheric Radars
- Descent & Landing Radars
- Science & Algorithm Development
- Calibration & Validation
- Ground Data Processing & Flight Radar Operations

Tracking Systems & Applications (335)



Jim Zumberge, Manager
 Yoaz Bar-Sever, Deputy Mgr

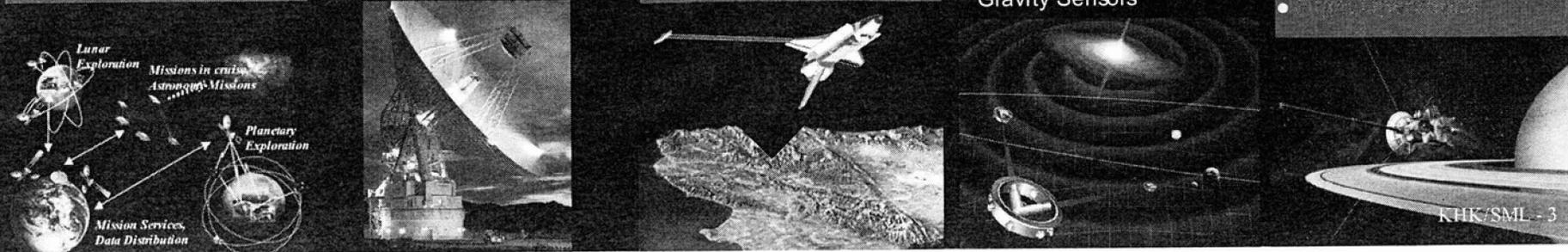
- Deep Space Tracking
- Frequency & Timing
- Ground Antenna Arraying, Correlators & Processors
- Geophysics & Astrophysics
- Ionospheric & Atmospheric Remote Sensing
- GPS Ground and Flight Instruments & Networks
- Real Time GPS Systems
- Formation Flying Sensors
- Precision Position & Gravity Sensors

Flight Communications Systems (337)



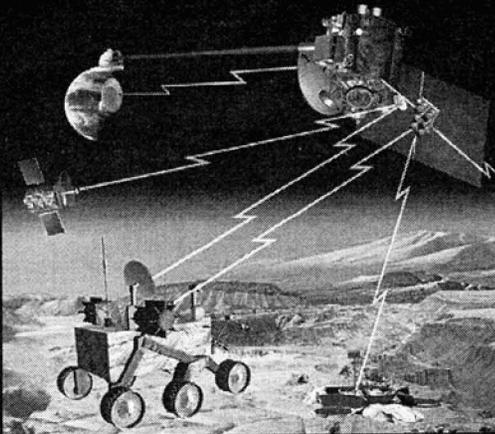
Jeff Srinivasan, Manager
 Vacant, Deputy Mgr

- Transponders
- Antenna Research & Development
- Electromagnetic System Interaction Modeling
-
-
- RF Power Amplifiers & High Voltage Supplies
-



Division 33: Communications, Tracking & Radar

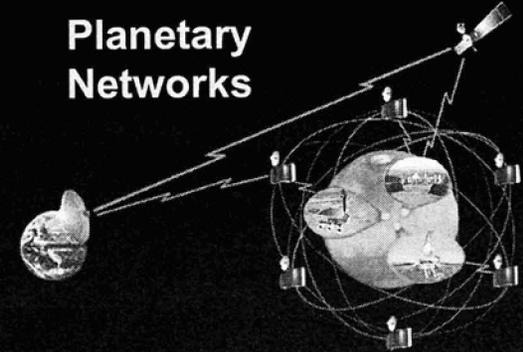
Developing New Capabilities to Enable the Vision for Space Exploration



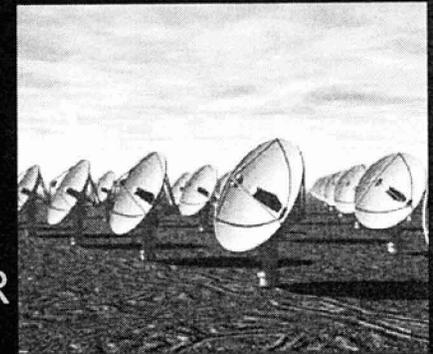
NASA Mars Telecom Orbiter will provide high capacity relays for orbital and surface assets, and will feature a Mars Laser Communications Demonstration experiment

- High-rate optical communications
- Autonomous relays
- Software-defined radios
- Agile beam antennas

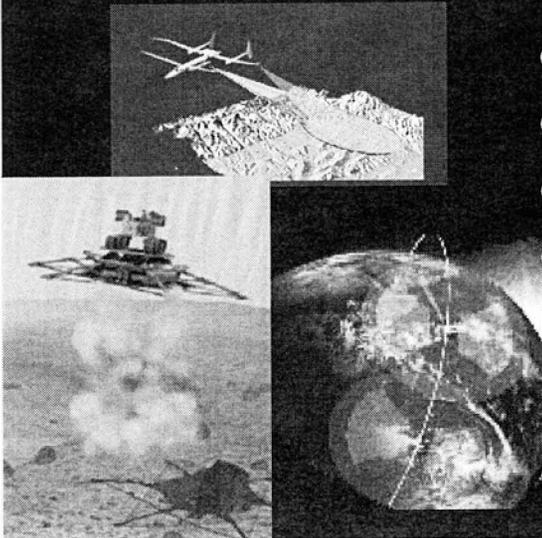
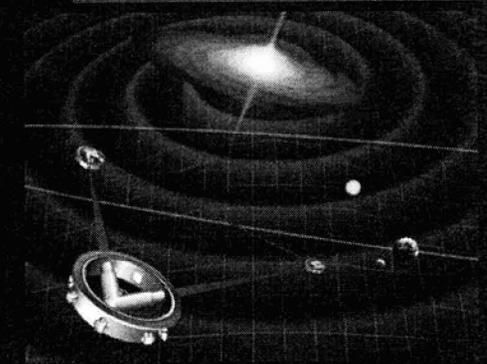
Planetary Networks



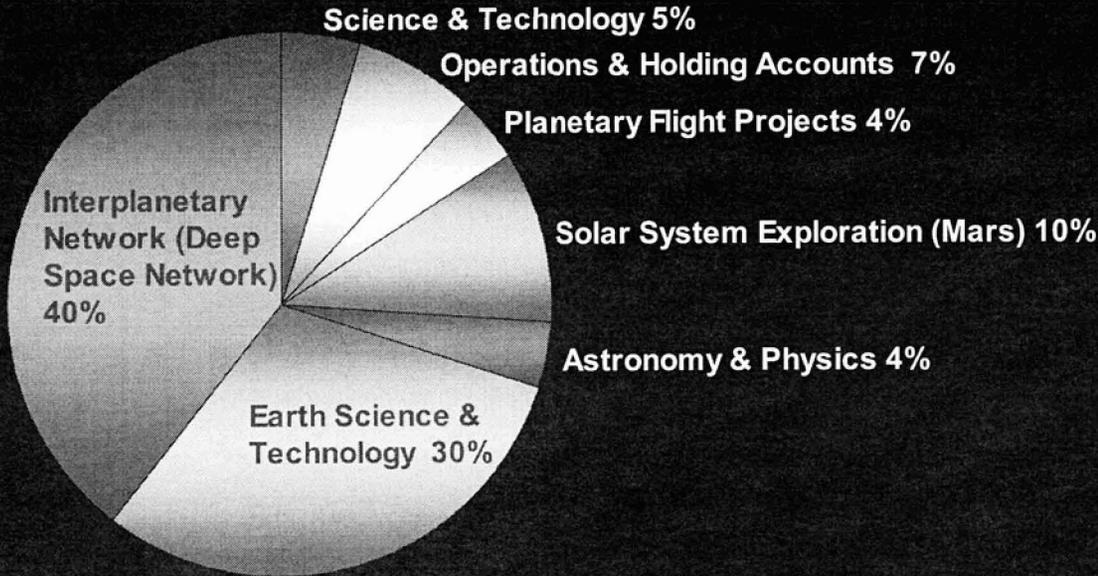
- Future Deep Space Network: arrays of small, low cost antennas
- Ultra-precise Ka-band tracking



- Single & repeat pass interferometric SAR
- Ultra-high resolution radar (Ka-band)
- Advanced GPS and GNSS Systems
- Planetary Entry, Descent & Landing terrain radars
 - Formation Flying Sensors
 - Distributed Intra-spacecraft communication systems

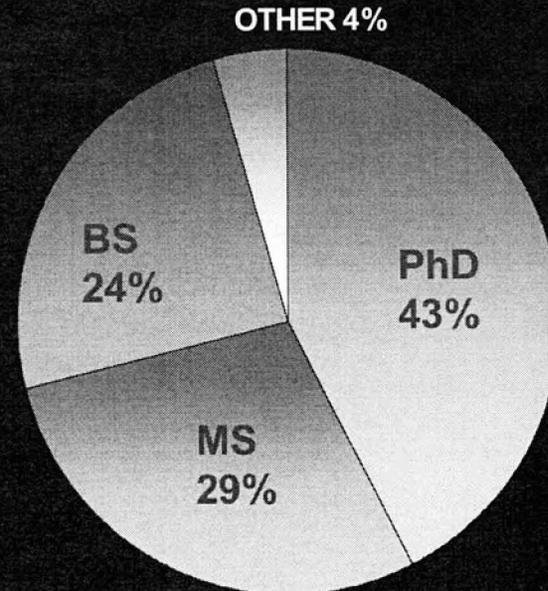


Division 33: Communications, Tracking & Radar Business Base and Workforce (FY'04)



- 530 Employees
- Majority degree type is EE, with significant representation in Science disciplines (Physics, Astronomy)
- Staff is well represented on national and international professional societies & governing boards
 - ▶▶ National Academies of Science
 - ▶▶ IEEE & URSI
 - ▶▶ AGU & others

- Deep Space Network includes communication and tracking engineering and operations, with associated technology development
- Earth science represents majority of radar and GPS missions & applications
- Relatively low workforce in Planetary, Mars, and Astronomy & Physics program areas because of contracted nature of work



Staff Education