



## Mission

### SRTM MISSION STATISTICS

Shuttle Radar Topography Mission  
Statistics  
Update 3/14/00

#### Mission Statistics:

Launch: February 11, 2000, 12:44 pm EST

Landing: February 22, 2000, 6:22 pm EST at Kennedy Space Center

Mission Duration: 11 days, 5 hours, 38 minutes

Project Start: August 1996

Project End: March 2001

Project Life Cycle: 60 months (42 months start to launch; 18 months data processing)

#### Data Statistics

Land coverage: Targetted land was 80% of Earth landmass (119.56 M km<sup>2</sup>, 46.16 M mi<sup>2</sup>)  
99.968% targetted land mapped at least once (119.51 M km<sup>2</sup>, 46.14 M mi<sup>2</sup>)  
94.59% targetted land mapped at least twice (113.10 M km<sup>2</sup>, 43.66 M mi<sup>2</sup>)  
49.25% targetted land mapped at least 3 times (58.59 M km<sup>2</sup>, 22.73 M mi<sup>2</sup>)  
24.10% targetted land mapped at least 4 times (28.81 M km<sup>2</sup>, 11.12 M mi<sup>2</sup>)

Land area missed: 50,000 km<sup>2</sup> (all in US)

Data Takes: 765 total  
399 C-band only  
1 X-band only  
365 C and X-band simultaneous  
674 data takes over land  
61 Built In Test Equipment (BITE) data takes  
28 'short' ocean calibration data takes  
2 'long' ocean calibration data takes

Data Tapes: 330 total high-density tapes used  
208 tapes with C-band data, plus one double-recorded (pilot) tape  
122 tapes with X-band data, plus one double-recorded (pilot) tape  
(C-band tapes each recorded ~ 30 min. of data at 180 Mbits/sec, X-band tapes recorded 60 min. of data at 90 Mbits/sec, and were on average 73% utilized)

Data Acquisition: 222.4 hours total duration of mapping phase  
99.2 hours C-band operation  
90.6 hours X-band operation  
8.6 Terabytes C-band data (=14,317 CDs)  
3.7 Terabytes X-band data (=6101 CDs)  
12.3 Terabytes total data (=20,418 CDs)  
(Approx. equal to Library of Congress)

Data Played Back 104 C-band playbacks  
During Flight 49 X-band playbacks

Energy used: 902.8 kWh (911 kWh planned)

Payload Weight: approximately 13,600 kg (approximately 29,000 lbs or 14.5 tons)

Mission Costs:       \$133M Mission Development Costs without Launch Delay  
                          \$8.2M Launch Delay Costs  
                          \$142M Total Mission Cost  
                          \$50M Launch Costs  
                          \$40M X-SAR Costs

**Mission Objective:**

To use C-band and X-band interferometric synthetic aperture radars (IFSARs) to acquire topographic data over 80% of Earth's land mass (between 60degN and 56degS) during an 11-day Shuttle mission. Produce digital topographic map products which meet Interferometric Terrain Height Data (ITHD)-2 specifications (30 m x 30 m spatial sampling with <=16 m absolute vertical height accuracy, <= 10 m relative vertical height accuracy and <=20 m absolute horizontal circular accuracy). All accuracies are quoted at the 90% level, consistent with National Map Accuracy Standards.

**Mission Firsts:**

- Fixed baseline single-pass spaceborne interferometric SAR
- Dual frequency (C-band and X-band) interferometric SAR
- Largest rigid structure flown in space

**Mast Information:**

Mast Length	60 m	200 feet
Nominal Mast Diameter	1.12 m	44.12 in
Nominal Bay Width at Longerons	79.25 cm	31.20 in
Nominal Bay Length	69.75 cm	27.46 in
Number of Bays	87	
Canister Diameter (at largest ring)	1.36 m	53.5 in
Stack Height/Bay	1.59 cm	0.63 in
Canister Length	2.92 m	115 in
Mast Mass	290 kg	640 lb
Canister Mass	695 kg	1530 lb

Mast Material:                   longeron material is carbon fiber reinforced plastic (CFRP);  
  Diagonal materials include stainless steel and alpha titanium.  
  Ball joints are made from hardened stainless steel.

Mast Construction:             AEC-Able Engineering Company, Inc. (ABLE), Goleta, California

**Mission Sponsors:**

- National Geospatial-Intelligence Agency (NGA)
- National Aeronautics and Space Administration (NASA)
- German Aerospace Center (DLR, Deutsches Zentrum für Luft- und Raumfahrt)
- Italian Space Agency (ASI, Agenzia Spaziale Italiana)

**Project Management:**

- Jet Propulsion Laboratory

**Data Product Applications:**

- Scientific applications:
  - Geology, geophysics, earthquake research, volcan monitoring
  - Hydrologic modeling
  - Co-registration of remotely acquired image data
- Civilian applications:
  - Enhanced Ground Proximity Warning Systems for aircraft
  - Civil engineering, land use planning
  - Line of sight determination for communications (e.g. cell phones)
- Military applications:
  - Flight simulators
  - Logistical planning, trafficability
  - Missile and weapons guidance systems
  - Battlefield management, tactics

**Implementation**

- Modifying and adding to SIR-C/X-SAR instruments flown successfully as Space Radar Laboratory Missions (SRL-1, April 1994; SRL-2 October 1994)
- Partnership: Major new components provided by industry.

#### Mission Manifest:

- STS-99 Shuttle Endeavour
- SRTM was a single payload mission
- Shuttle travelled tail forward at 7.5 km/sec (17,000 mph)
- Attitude was rolled 59 deg from the bay-down orientation, placing the mast at 45 deg from vertical
- Nominal altitude: 233 km (approximately 126 nautical miles, 145 statute miles) with orbital adjustment once per day
- 150 data acquisition orbits plus activation, on-orbit checkout and de-activation
- 6-member crew to activate payload, deploy and stow mast, align inboard and outboard antennas, monitor payload flight systems, operate on-board computers & recorders, & handle contingencies

STS-99 Crew Commander: Kevin Kregel

Pilot: Dom Gorie

Mission Specialists: Janet Kavandi, Janice Voss, Mamoru Mohri (NASDA), Gerhard Thiele (ESA)

#### Significant Contractors:

- AEC-ABLE Engineering, Goleta, CA (deployable mast & canister)
- America Technology Consortium, Camarillo, CA, (motors and actuators)
- Ball Telecommunication Products Division, Boulder, CO (outboard antenna)
- Daimler-Benz Aerospace (Dornier Satellite Systems), Friedrichshafen, Germany (X-band radar system)
- Composite Optics Inc., San Diego, CA (composite outboard structure)
- ENERTEC, France (onboard high rate recorders)
- Lockheed Martin, Palo Alto, CA (star tracker)
- Mission Space, La Canada, CA (command & telemetry systems)
- JDS Uniphase Corporation, Chalfont, PA (calibration optical link)

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This website was designed by Eric Ramirez  
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