



Satellites

Space Transportation

Services



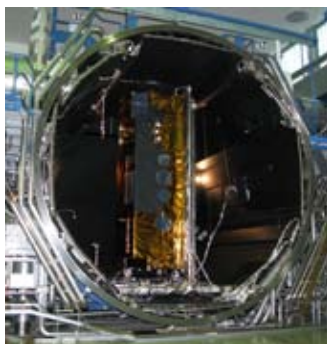
## TANDEM-X

The TanDEM-X (TerraSAR-X Add-on for Digital Elevation Measurement) mission will create a global Digital Elevation Model (DEM) with unprecedented accuracy. TanDEM-X is a companion satellite to the existing and highly successful TerraSAR-X satellite and, with the two satellites flying in a tandem formation, data from each radar system will be used to build up the Digital Elevation Model.

The Digital Elevation Model data will be collected during the first 3 years of TanDEM-X's operations and the nominal imaging capability of the TerraSAR-X mission will be continued. During this period a DEM area up to 150 million km<sup>2</sup> with a 2m height resolution will be collected and made available to scientists and commercial users. Uses range from relief maps, precision farming or safety applications.

The major design changes of TanDEM-X compared to TerraSAR-X are the Inter-Satellite Link equipment and the Cold Gas System. The Inter-Satellite Link allows reception of TerraSAR-X status and position/velocity data from its S-band telemetry which are used on-board TanDEM-X to suppress radar transmission and orbit manoeuvres in critical situations and to feed autonomous formation flying algorithms.

The TanDEM-X mission is a Public-Private Partnership between DLR – the German Space Agency – and Astrium, a cooperation to meet scientific and commercial goals. DLR is providing the Ground Segment and owns the data and coordinates the scientific utilisation. Astrium is the prime contractor for the Space Segment (including radar) and finances part of its cost. Astrium's subsidiary, Infoterra serves the commercial customers and provides a sales-dependent share of the operating costs.



TanDEM-X in the thermal vacuum chamber ready for Thermal Vacuum/Thermal Balance testing

All the space you need





<b>Customer</b>	DLR (Deutsches Zentrum für Luft- und Raumfahrt)
<b>Mission</b>	To generate a global Digital Elevation Model (DEM) with unprecedented accuracy
<b>Orbit</b>	Sun-synchronous dusk-dawn orbit
<b>Spacecraft</b>	Rebuild of the TerraSAR-X satellite which was based on the Astrium Flexbus concept and extensive heritage from the CHAMP and GRACE missions
<b>Payload</b>	<ul style="list-style-type: none"> <li>Active phased array X-band Synthetic Aperture Radar (SAR)</li> <li>Tracking, Occultation and Ranging (TOR) equipment (SAR)</li> </ul>
<b>Features</b>	<ul style="list-style-type: none"> <li>X-band downlink horn antenna is mounted at the tip of a 3.3m long boom</li> <li>Solid state mass memory capacity is 768Gbit</li> <li>High-pressure nitrogen gas propulsion system for formation flying</li> </ul>
<b>Launch Mass</b>	1340kg (spacecraft: 1220kg, fuel: 120kg)
<b>Dimensions</b>	5m length, 2.4m diameter (hexagonal cross section)
<b>Launch Date</b>	June 2010 on DNEPR-1 rocket from Baikonur
<b>Mission Duration</b>	5 years
<b>Astrium Responsibilities</b>	Prime contractor, SAR and satellite integration and testing, manufacturer of many electronic units including On-Board Computer and Solid State Mass Memory

### Key Features:

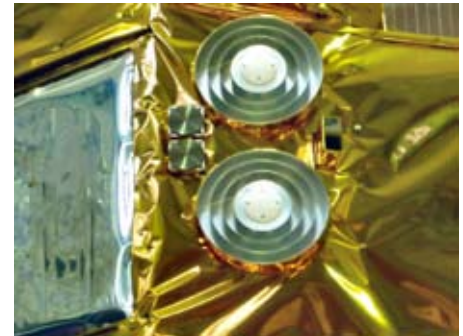
The TanDEM-X mission became a vision during the development of the TerraSAR-X satellite and a necessary extension of the SAR design on TerraSAR-X has enabled a synchronised operation of both radars. The platform design on TanDEM-X was extended to allow formation flight of both satellites. The software changes have been verified during the TanDEM-X on-ground tests and will be uplinked to TerraSAR-X in preparation for the formation flight.

The main payload is the active phased array X-Band Synthetic Aperture Radar (SAR) at 9.65 GHz which allows for weather-independent Earth imaging day or night. 3 basic modes of operation are used:

- StripMap (standard mode) which gives an on-ground resolution of 3 metres and a measurement swath width of 30km
- Spotlight mode with an azimuth (along track) scanning to give a resolution of 1 metre with measurement scene 'patches' of 10km x 10km
- ScanSAR mode with elevation (across track) scanning to give a resolution of 16 metres and a measurement swath width of 100km




TanDEM-X has an additional high-pressure nitrogen gas propulsion system. This cold gas system provides smaller impulses than the hydrazine system (used on both satellites for orbit maintenance) and supports formation flying by fine orbit control of the TanDEM-X satellite. Using this system, TanDEM-X and TerraSAR-X will fly together in a helix orbit which is passively safe so that the satellites drift apart in case of no manoeuvres. TanDEM-X has an autonomous formation flying control capability which may be used operationally after in-orbit validation.

The SARs on both satellites have the same design which allows exchange of synchronisation pulses to provide inter-SAR coherence. Both satellites have the same Tracking, Occultation and Ranging equipment provided by the GeoForschungsZentrum Potsdam (GFZ) which allows Precise Orbit Determination (POD) to give the radar baseline needed to generate interferometric data for DEMs.



The POD and Inter-Satellite Link antennas on TanDEM-X

### INDUSTRIAL TEAM

	<ul style="list-style-type: none"> <li>Astrium</li> <li>ALTRAN Technologies</li> <li>EADS Defence Electronics</li> <li>GFZ Potsdam</li> <li>Haberer SpaceTec</li> <li>HBH</li> <li>Huber &amp; Suhner</li> <li>IABG</li> <li>IMST</li> <li>Invent</li> <li>Jena-Optronik</li> <li>Rockwell Collins</li> <li>Schorpp</li> <li>STT Systemtechnik</li> <li>Tesat-Spacecom</li> <li>Xperion</li> <li>ZARM</li> </ul>
	RYMSA
	<ul style="list-style-type: none"> <li>ABSL</li> <li>SSTL</li> </ul>
	<ul style="list-style-type: none"> <li>Billingsley Aerospace &amp; Defense</li> <li>Northrop Grumman</li> <li>Times Microwave</li> </ul>
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TOGETHER WITH



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