



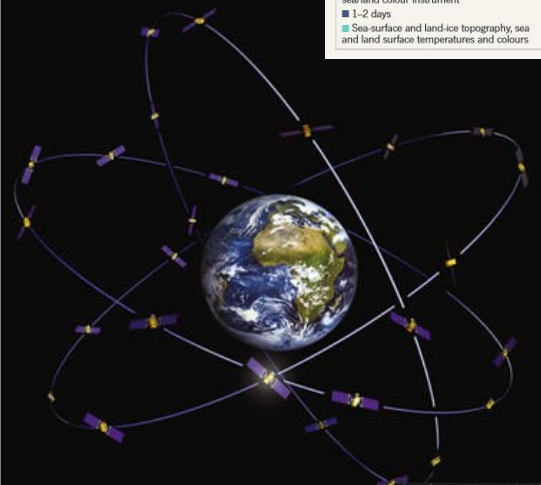
WATCHERS IN THE SKIES

Once its Sentinel satellites are fully operational, Copernicus will probably be the world's most comprehensive Earth-observation programme. In addition to Sentinels 1 to 6, a Sentinel 5 Precursor satellite will be launched in 2016 to minimize the gap in atmospheric data following the expiration of Envisat in 2012.

- SENTINEL-1**
 Launch date: 1A: Launched; 1B: 2015
 Payload: All-weather radar
 Revisit time: 1-3 days
 Applications: Monitoring sea ice and the Arctic, land surface motion risks, disaster response
- SENTINEL-2**
 2A: 2015; 2B: 2016-17
 Optical sensors with 13 bands
 2-5 days
 Monitoring land-use changes, agriculture and ecosystems, volcanoes and landslides
- SENTINEL-3**
 3A: 2015; 3B: 2016-17
 Sea/land temperature radiometer, sea/land colour instrument
 1-2 days
 Sea-surface and land-ice topography, sea and land surface temperatures and colours

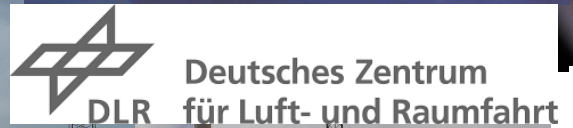
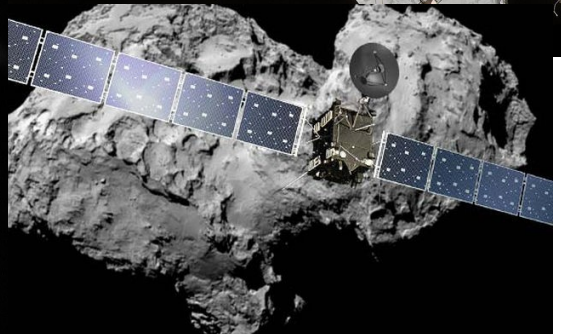
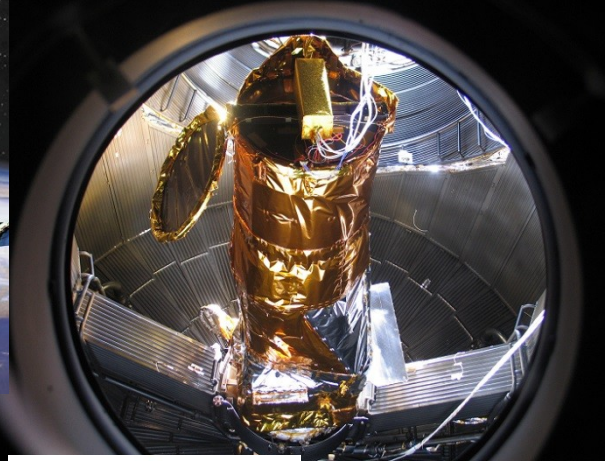
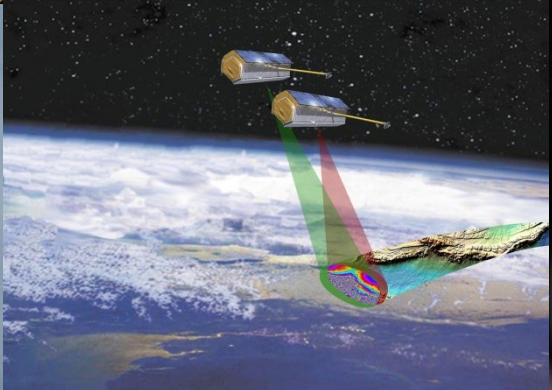


- SENTINEL-4**
 Near end of this decade
 Ultraviolet/visible/near-infrared spectrometer
 Geostationary. Hourly coverage of Europe/North Africa
 Monitoring of air pollution, stratospheric ozone, solar radiation
- SENTINEL-5**
 Near end of this decade
 Ultraviolet/visible/near-infrared/shortwave spectrometer
 17 days
 Monitoring of air pollution, stratospheric ozone, solar radiation and climate
- SENTINEL-6**
 Mission still under discussion
 Radar altimeter
 Under discussion
 Measure global sea-surface height for oceanography and climate studies

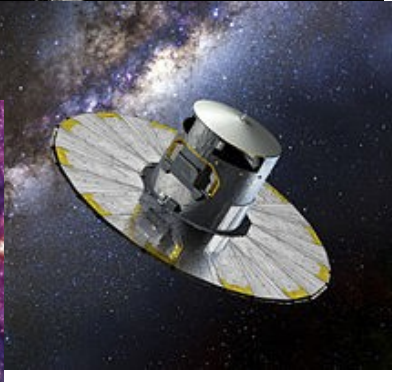


Europe as a Leader in the Space Age

European Conference 2017

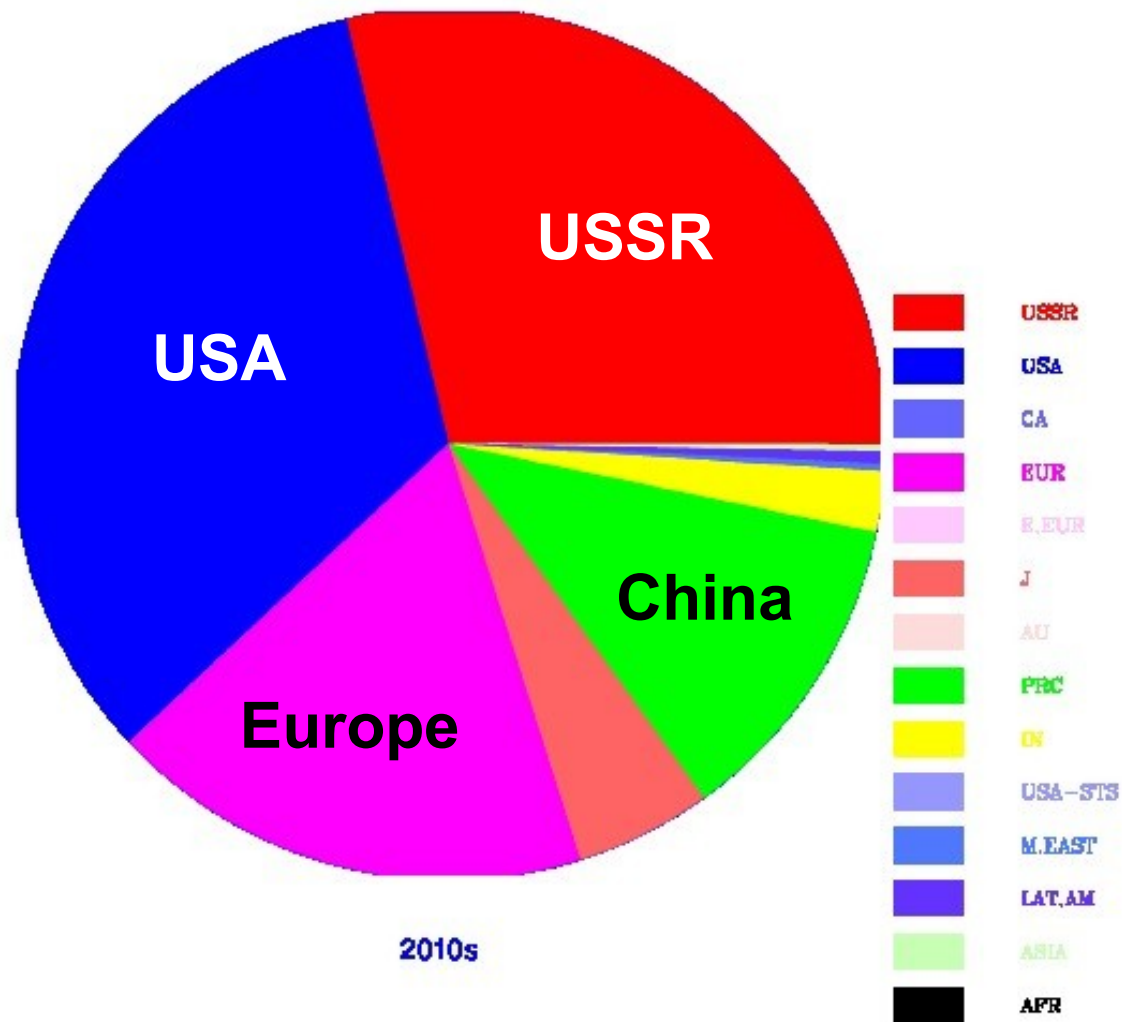


Deutsches Zentrum für Luft- und Raumfahrt



Europe in Space European Space Agency:
 Founded 1975 X
 satellites launched X
 European astronauts flown in space HQ
 (Paris) - policy ESTEC
 (Noordwijk, NL) - applications and sci.
 satellites, space probes ESAC (Villafranca,
 E) - space astronomy ESOC (Darmstadt,
 D) - mission control, space debris
 monitoring EAC (Köln, D) -
 astronaut training National European space
 agencies: CNES (France) DLR (Germany)
 INTA (Spain) ASI (Italy) UKSA (UK) Major
 European space industrial concerns: Airbus
 Defense and Space (Stevenage, Bremen,
 Cannes) Thales Alenia Space (Rome, Turin,
 Toulouse) Arianespace (Paris) Major
 European space programs: - Satellite
 programs: Galileo, Sentinel - Human
 spaceflight programs: ISS/Columbus -
 Rockets: Ariane/Vega/Soyuz - Space probes
 and astronomy: Rosetta, ExoMars, Bepi-
 Colombo,
 Gaia, Athena, Herschel/Planck

Satellite Tonnage by Manufacturer Country



2010s

Excludes Shuttle

European Space Key Locations At A Glance

ESA Centres:

ESTEC – satellites and probes (Noordwijk, NL)
ESAC – space astronomy (Villafranca, Spain)
EAC – astronauts (Koln, Germany)
ESOC – mission control (Darmstadt, Germany)
ESA HQ - Paris

National Agencies

CNES (Toulouse, France)
DLR (Koln, Germany)
ASI (Roma, Italy)
INTA (Madrid, Spain)

Space Industry

Arianespace, Paris-Evry
Airbus Safran Launchers, Paris
Airbus Defense and Space
(Stevenage, Bremen, Friedrichshafen, Toulouse)
Thales Alenia Space
(Cannes, Torino, Roma)

Launch Sites

Suborbital - ESRANGE, Kiruna, Sweden
Orbital – CSG, French Guiana, S America

