Astro- und Feinwerktechnik Adlershof GmbH

Astro-
und Feinwerktechnik
Adlershof GmbH

the EU-Japan Support Mission in the Space Sector

07th of September 2017
Sapporo, Japan

Dr.-Ing. Sebastian Scheiding
s.scheiding@astrofein.com

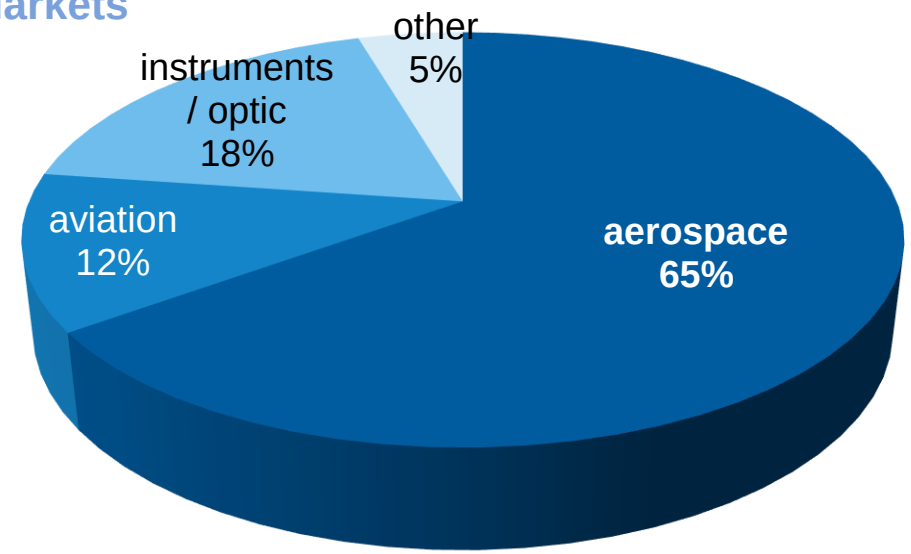
Astro- und Feinwerktechnik Adlershof GmbH

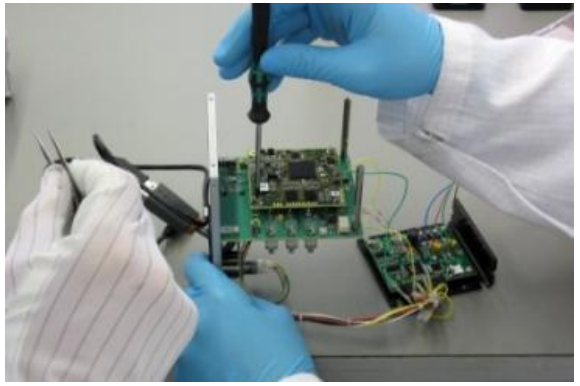
Established October 1993

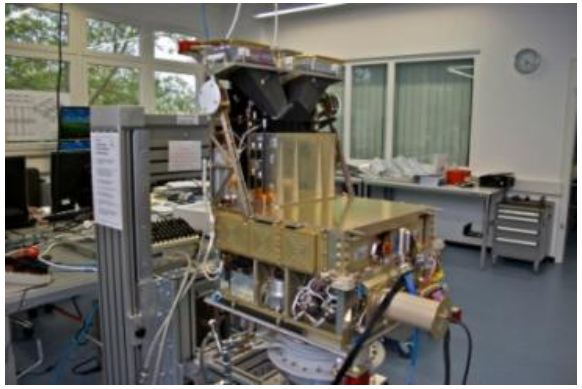
spin off from the Institute for Space Sensor Technology of the German Aerospace Center (DLR), Berlin-Adlershof

Supplier of components ➔ **Systems for space / Small System Integrator**

Markets







Astro- und Feinwerktechnik Adlershof GmbH - Company overview

Astro-
und Feinwerktechnik
Adlershof GmbH

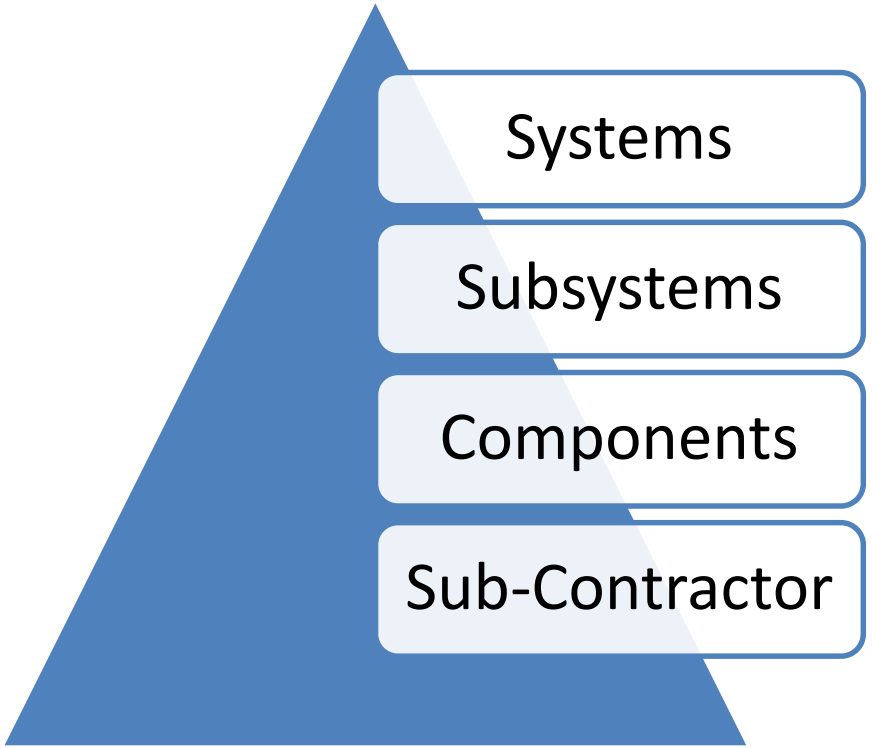
Quality Management

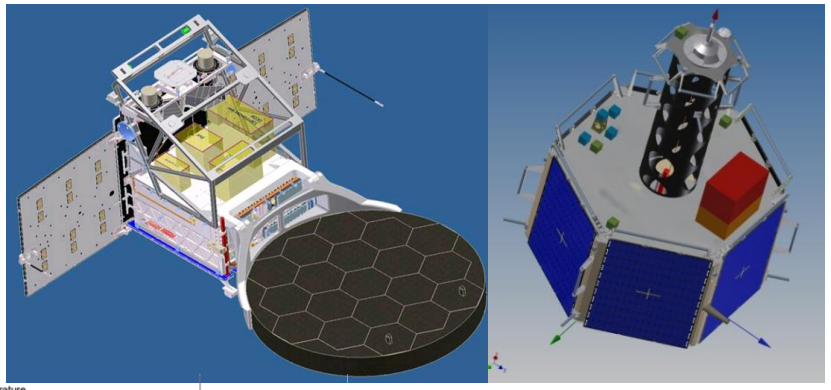
Processes and Documentation is conform to **ECSS**-Standards and Certified by **ESA**

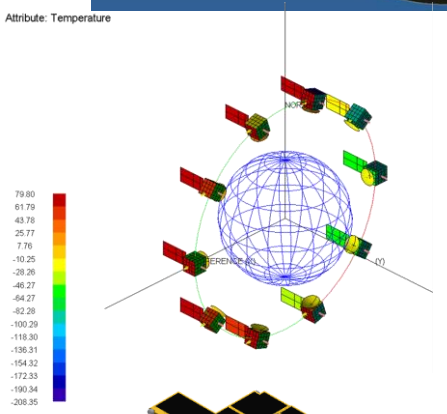
Certified according to **DIN EN ISO 9001**:2008 and **DIN EN 9100**:2009

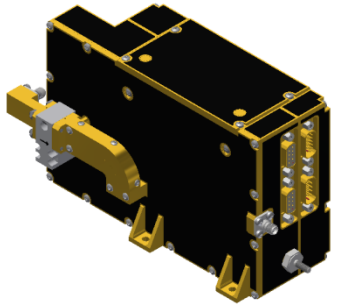
System Competence - Astrofein

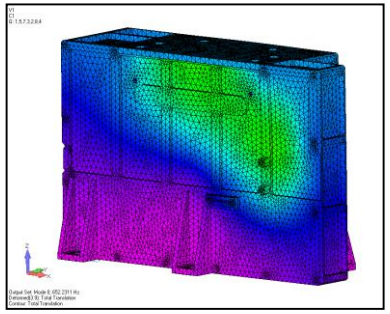
Astro-
und Feinwerktechnik
Adlershof GmbH







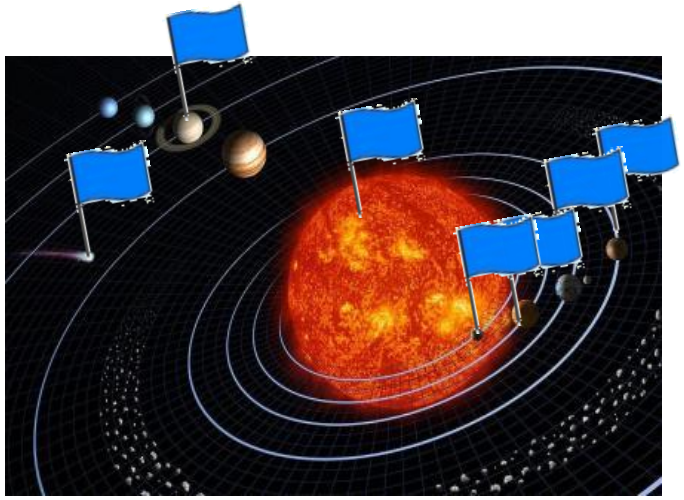




Strategy:

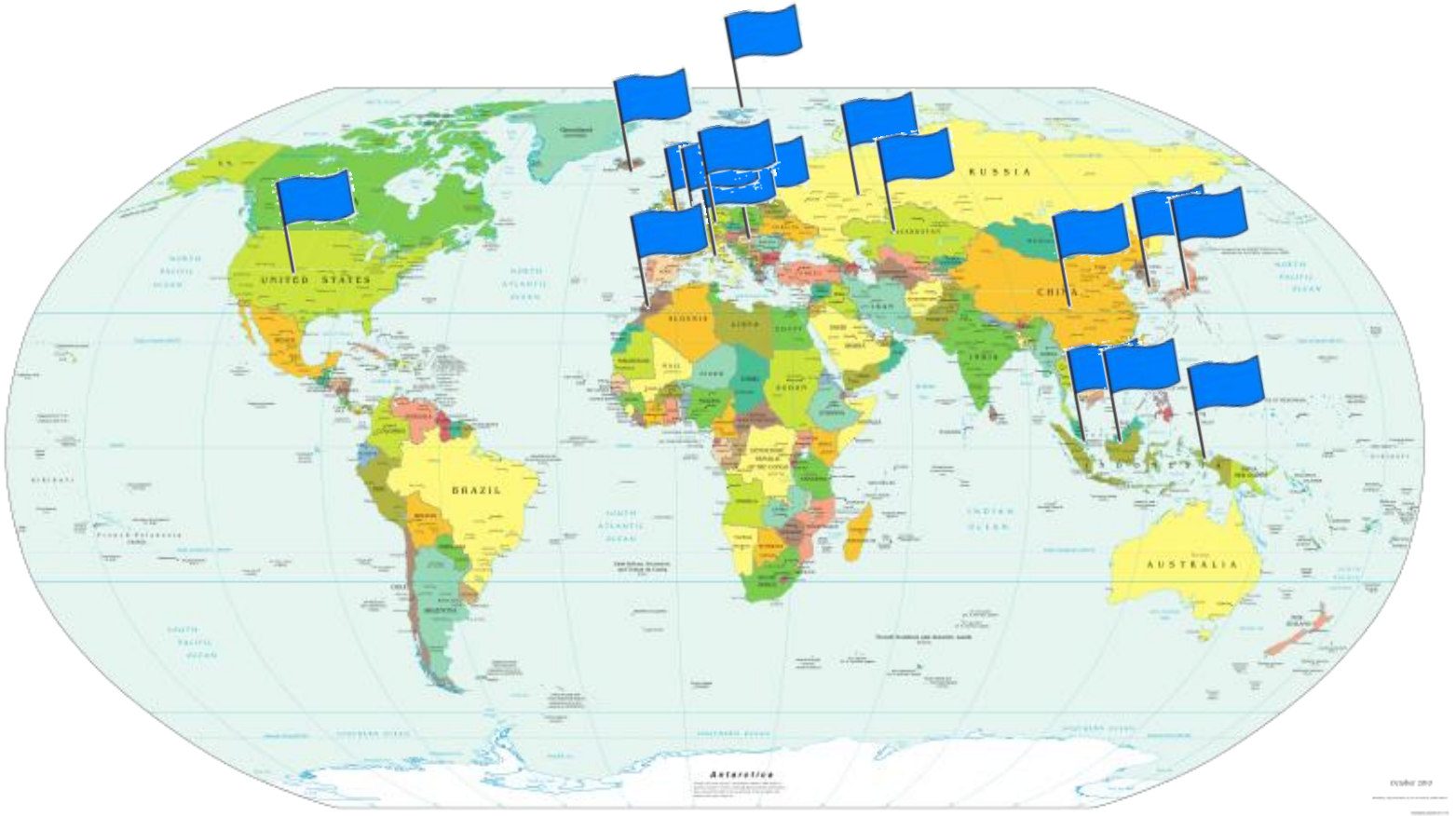
- **Sub-Contracting (e.g. build to print) as base**
- **Components as growing share within the commercialization**
- **Subsystems as contribution to large projects within DLR/ESA framework**
- **System competency as small system integrator**

Markets and Partners worldwide and beyond

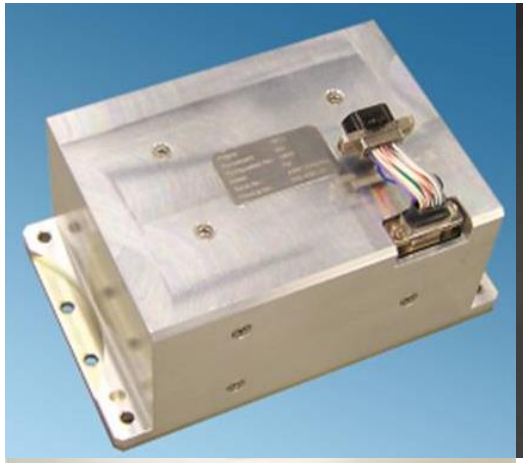


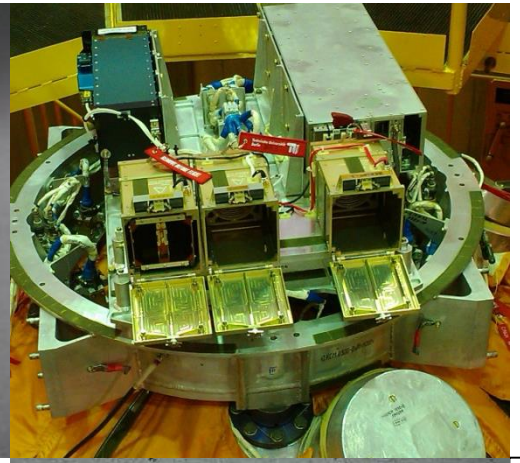
Participation on different space missions …

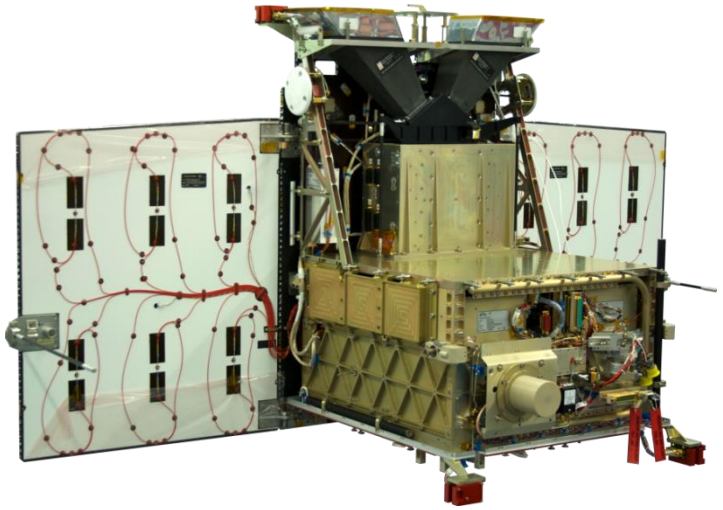
… products and projects worldwide



Astro- und Feinwerktechnik Adlershof GmbH - Products



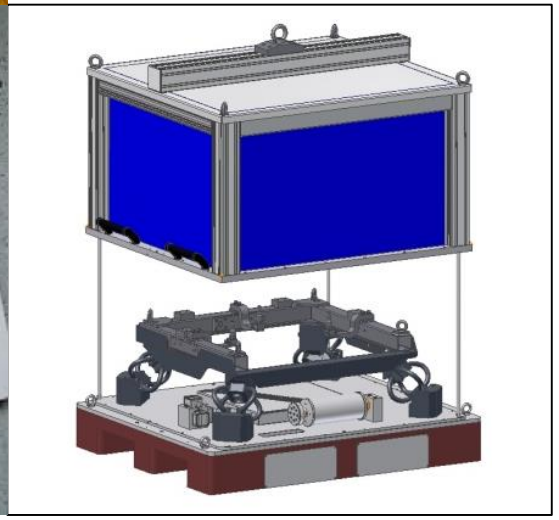




Systems

Attitude Control

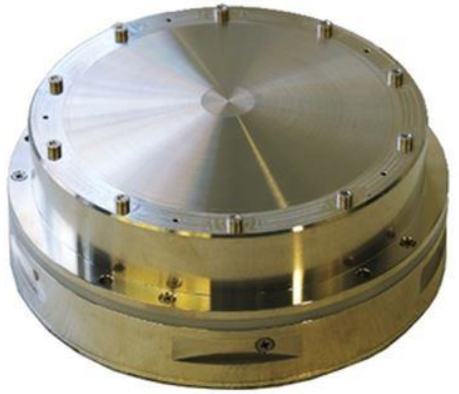
Mechanism Sub-Systems

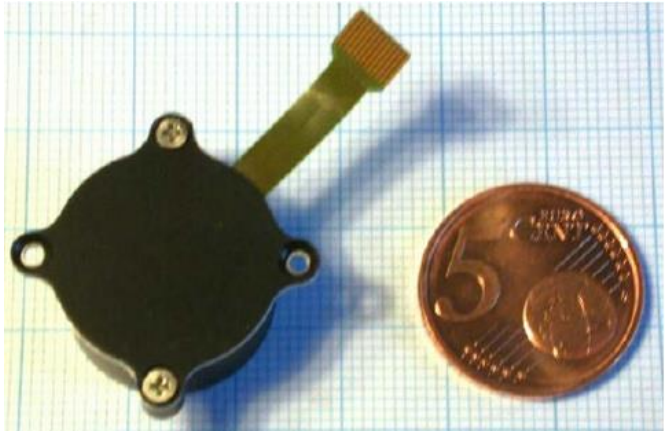


MGSE / EGSE

Products - Reaction Wheels

- RW 1 for **Cubesats** (10^{-4} Nms) (FKZ 50JR0552)
- RW 35 for **Nano- and Microsatellites** (0,1 Nms)
- RW 90 for **Small- and Microsatellites** (0,34 Nms)
- RW 150 for **Small Satellites** (1 Nms)
- RW 250 for **Small Satellites** (4 Nms)





Smart Reaction Wheels

Digital Interface: Supports Plug & Play

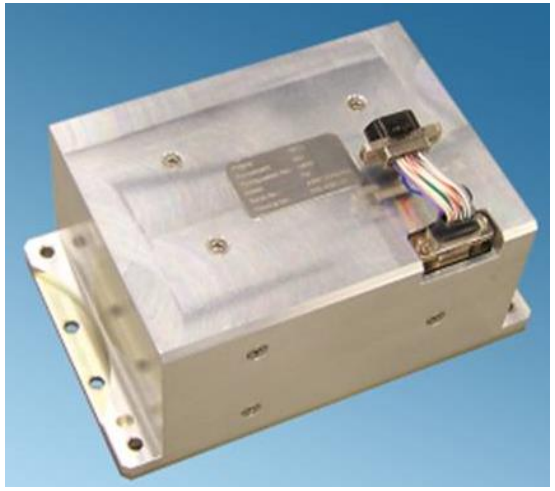
Monitoring and protective mechanisms:

- Voltage and current monitoring and protection mechanisms
- Temperature monitoring and protection against overheating
- Monitoring and protection mechanisms of the data processing system

Model based controllers features:

- Automatic compensation of displacements and time delays
- Estimation of acceleration reserve
- Power limitation

Attitude Control Sensors



AGS-1 (3-axis FOG system)

Parameter	Data
Channels	3
Maximum angle increment	0.2 °
Resolution	24 bit
Measurement cycle	200 Hz
→ Maximum angular rate	40 ° /s
Random walk (per channel)	0.1 ° /√h
Bias (per channel)	1 ° /h
Linearity (per channel)	< 0,15%

AGPS (GPS-Receiver)

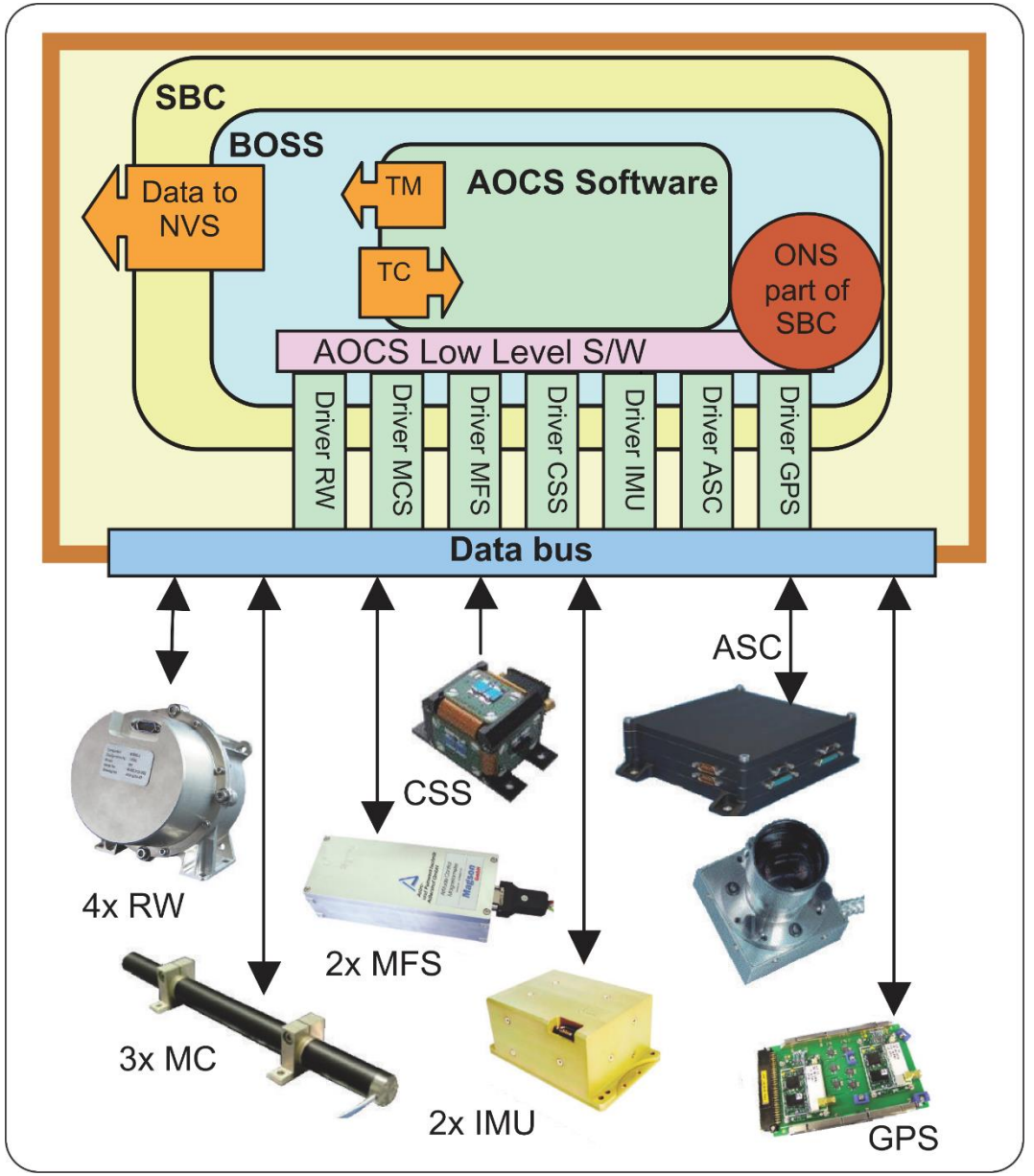
Parameter	Data
Channels	12 channels
Code	L1 C/A and carrier
Position accuracy	10 m (1σ) , 1m (filtered)
Velocity accuracy	0.1 m/s (1σ)
Warm start time	< 2 min
Cold start time	< 15 min (90%)
Frequency of navigation data	up to 1 Hz

ACM (Magnetometer)

Parameter	Data
Channels	3
Range	± 60000 nT (up to ± 140000 nT possible)
Resolution	100 pT/LSB
Noise	< 50 pT/√Hz @ 60 000 nT
Linearity	0.025%

ADCS - Systems

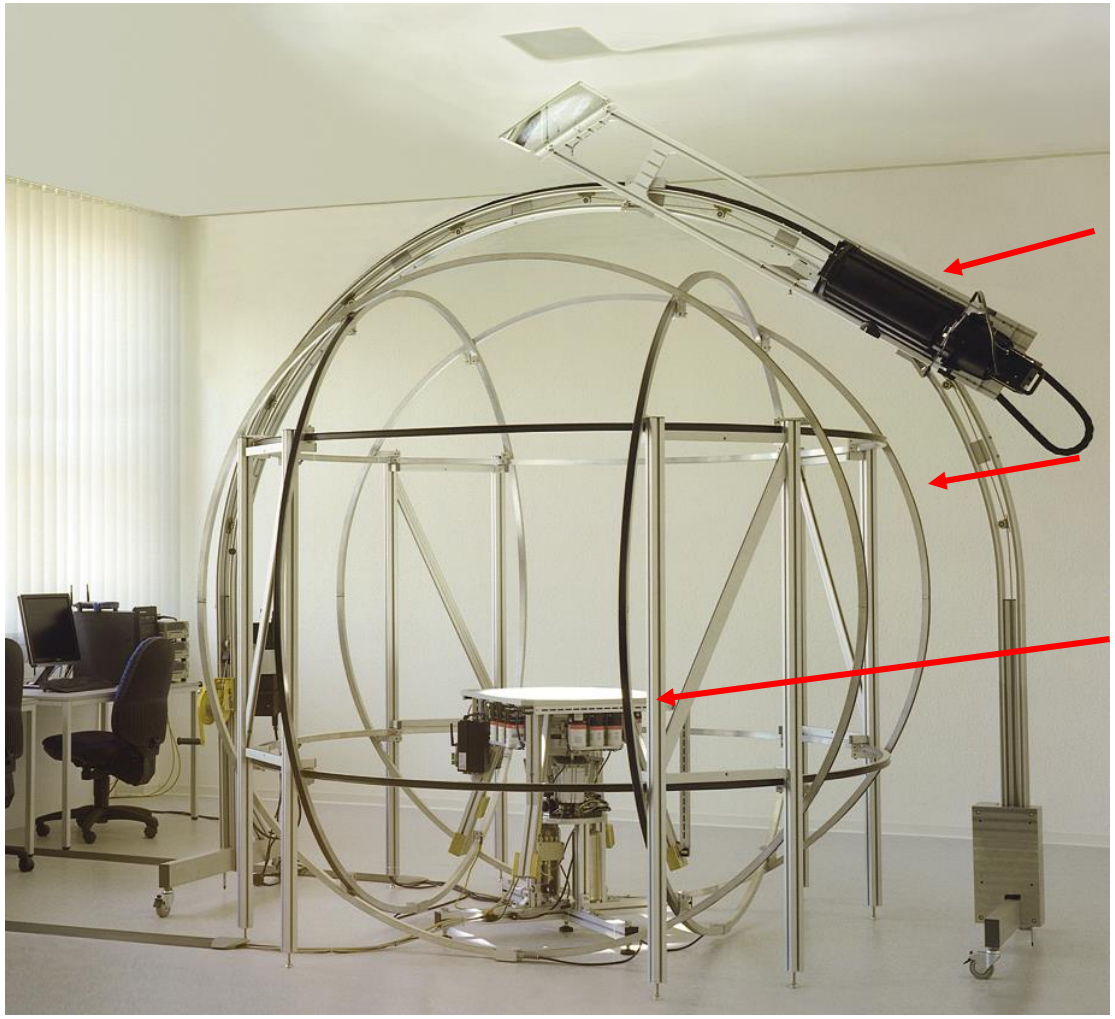
- **High agile and reliable ADCS Systems**
  - 4 reaction wheels (RW, tetrahedron configuration)
  - magnetic torque system (MTS)
  - star tracker system (ASC)
  - magnetic field sensors (MFS)
  - sun sensor system (CSS)
  - inertial measurement units (IMU)
  - GPS
- **High resolution earth observation**
  - attitude knowledge better 10 arcsec,
  - position 1 m,
  - velocity 0.1 m/sec
- **Including complete End-to-End testing (Testbed)**



AOCS Testbed

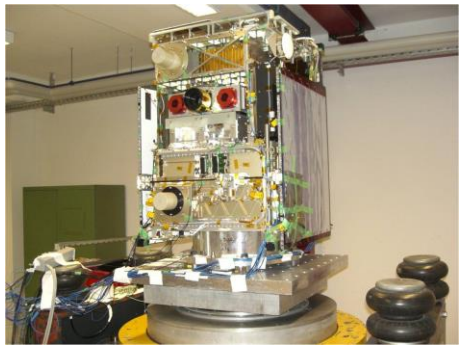
- Test facility consists of a test platform on an air bearingtable
- a sun simulator and
- a magnetic field simulator and
- GPS simulation
- Star simulator are available (as option)
- Add on for CubeSat testing

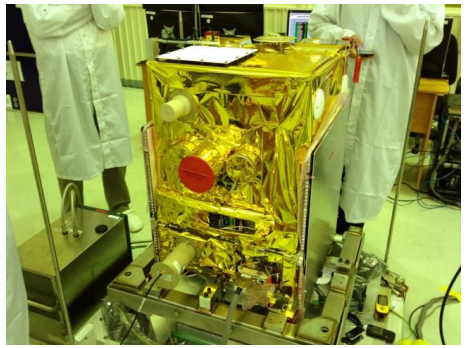
- Including training for test engineers and AOCS experts

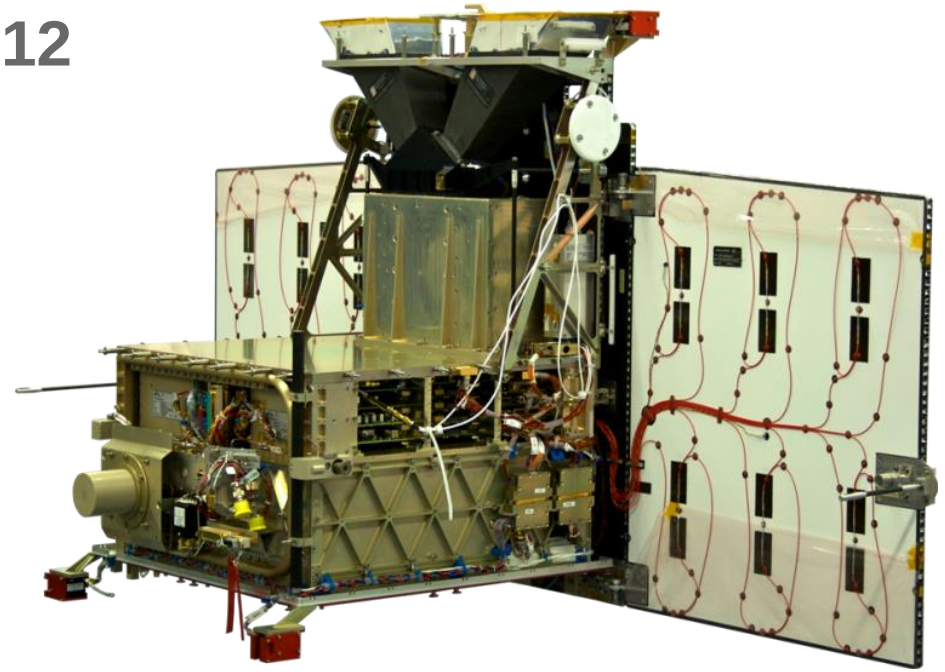


Test stand overview

TET-1 successfully launched on 22nd July 2012







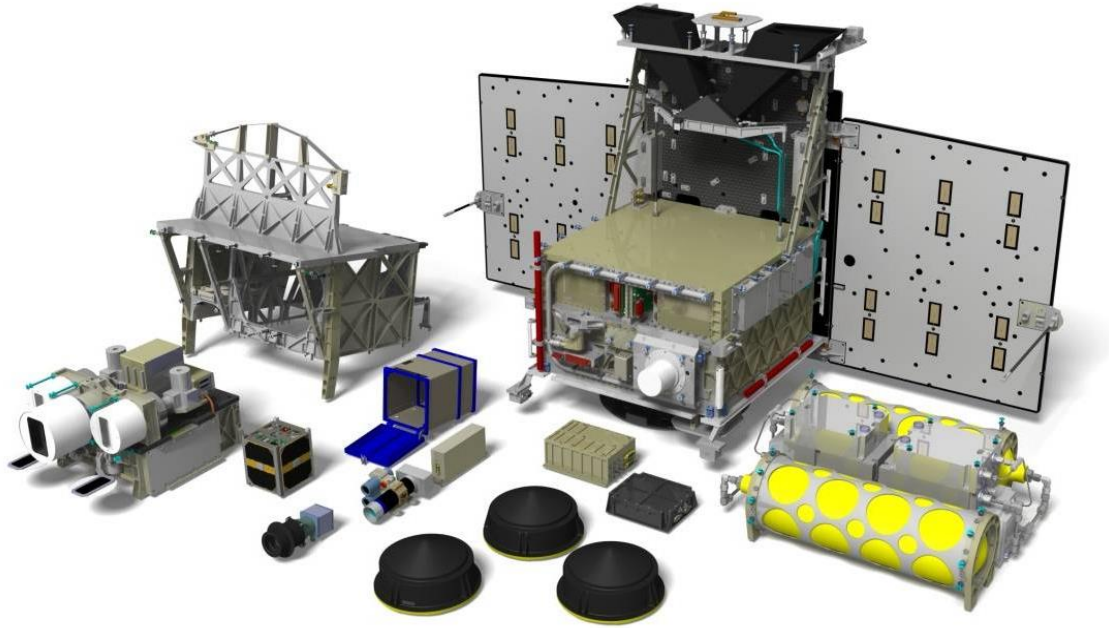
Technical data:

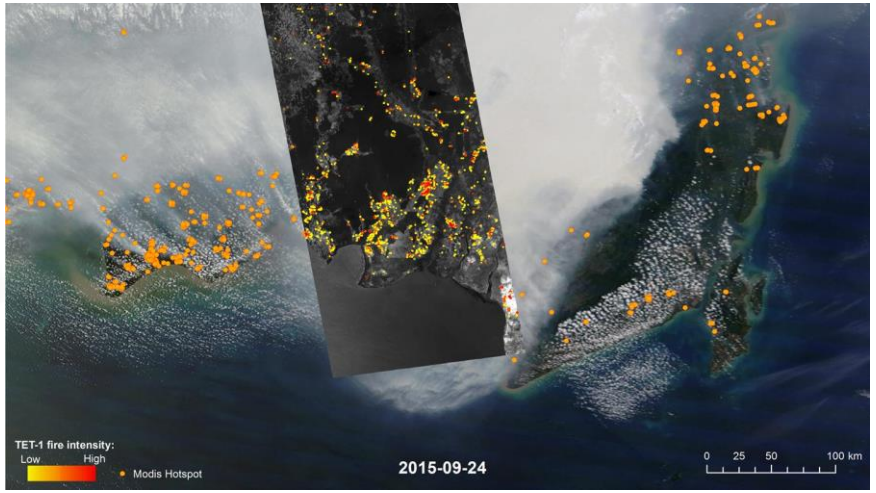
- Satellite Envelope:
  (670 x 580 x 880) mm³
  (1540 x 580 x 880) mm³
- Payload volume:
  (460 x 460 x 428) mm³
- Satellite bus: < 70 kg
- Payload: 50 kg

BIROS successfully launched on 22nd June 2016

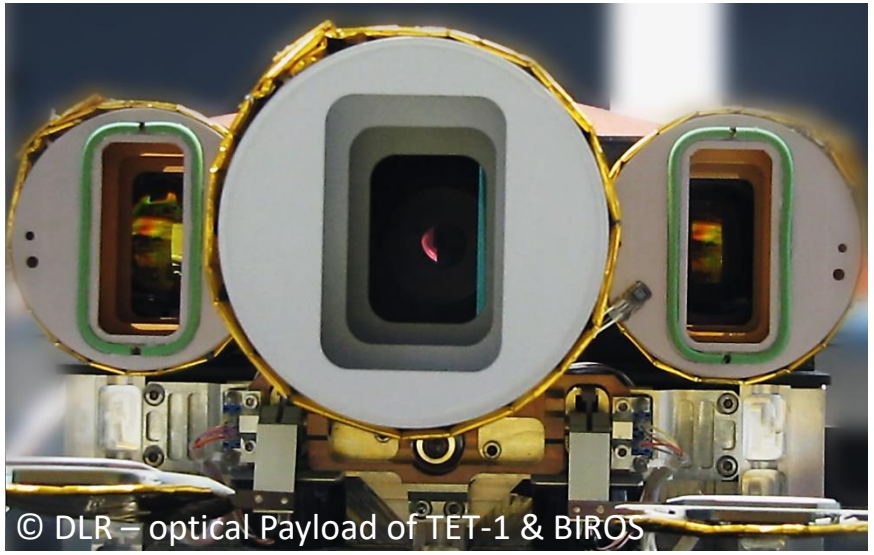
Primed by DLR – Institute of Optical Sensor Systems

- ASTROFEIN involved in the structural and thermal design and in the manufacturing, assembly and testing
- Integration of BIROS is based on TET-1 platform
- Flying with TET-1 as FIREBIRD constellation

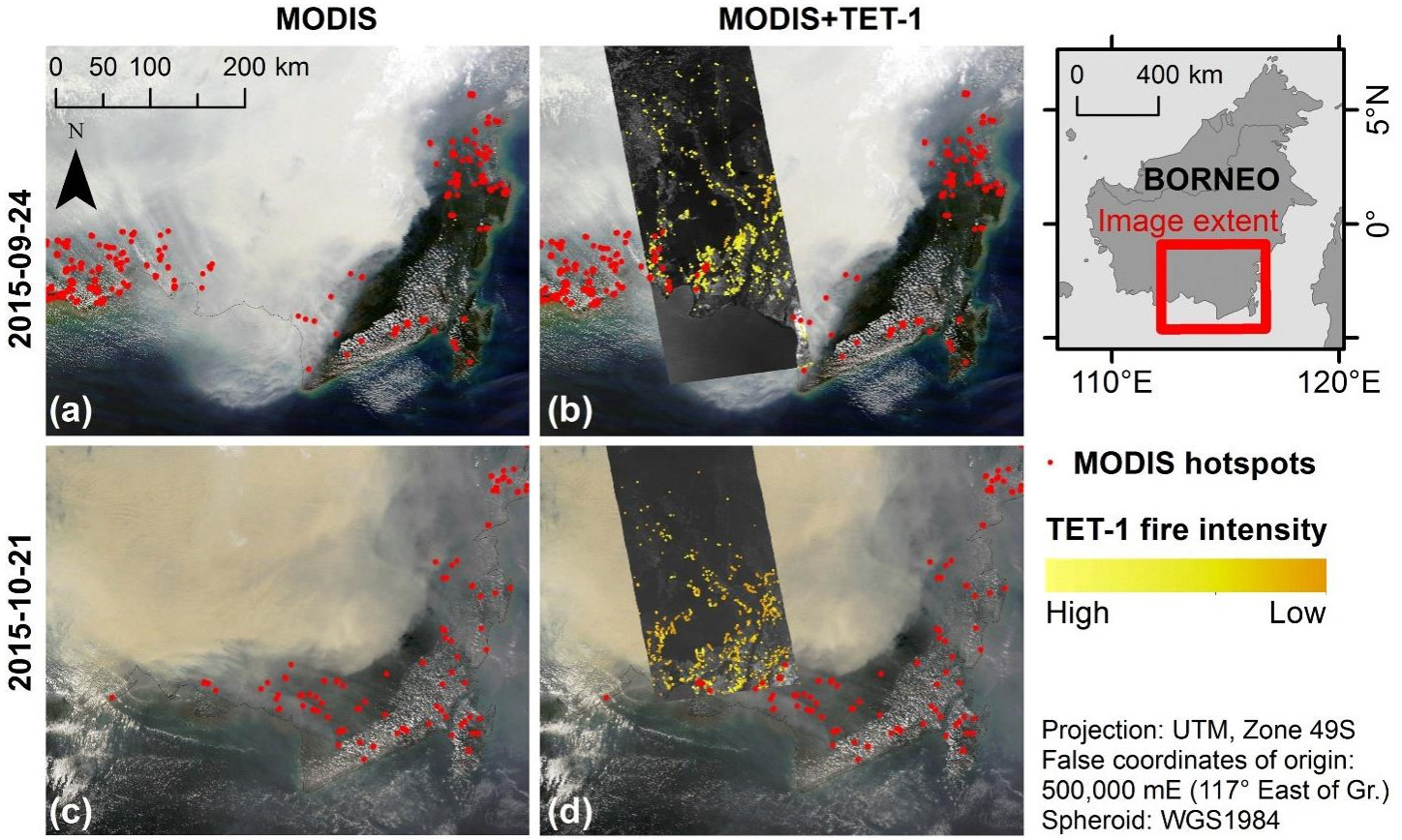




Optical Payload designed and built by DLR-OS



Parameter	VNIR camera	Bi-spectral infrared camera
Wavelengths	Line 1: 460-560 nm Line 2: 565-725 nm Line 3: 790-930 nm	MWIR: 3.4 - 4.2 µm LWIR (TIR): 8.5 - 9.3 µm
FOV (Field of View)	19.6º	19º
F number	3.8	2.0
Detector type	CCD-line array	CdHgTe line arrays
Detector cooling	Passive, 20ºC	Stirling, 80-100 K
Detector element size	7 µm x 7 µm	30 µm x 30 µm
No of pixels	3 x 5164	2 x 512 staggered
Data quantization	14 bit	14 bit
Ground pixel width	42.4 m	356 m
Sample width	42.4 m	178 m
Swath width	211 km	178 km
In-flight calibration	None	Use of a removable calibration flap
Instrument mass	< 12 kg	



(a) MODIS Aqua true color (R, band 1 0.62–0.67 µm; G, band 4 0.55–0.57 µm; B, band 3 0.46–0.48 µm; source NASA) image from Sept. 24th, 2015, superimposed with same day MODIS hotspot data (red dots; source FIRMS collection MCD14).

(b) The MODIS image overlaid with same day TET-1 gray-scale acquisition (source DLR FireBird Mission). MODIS hotspot data appear to under-detect low intensity fire fronts visible in TET-1 imagery (intensity of detected fire pixels indicated by yellow gradient).

(c) MODIS imagery from Oct. 21st, 2015, superimposed with same day MODIS hotspot data. (d) The MODIS image overlaid with TET-1 imagery, which shows MODIS hotspot active fire detection being inhibited by thick smoke and haze.

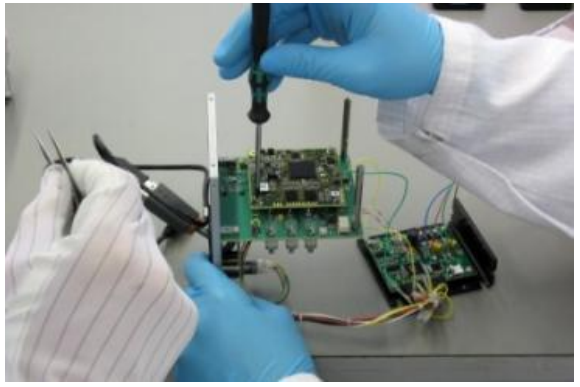
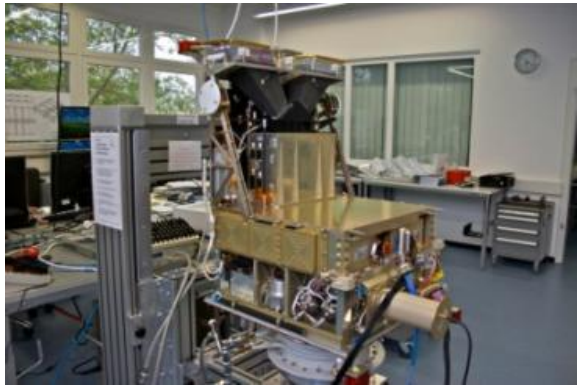
Astro- und Feinwerktechnik Adlershof GmbH

[source:]

Astro- und Feinwerktechnik Adlershof GmbH

We offer

- **Value chain, knowledge & processes within the company**
  60% of all satellite components within the company
- **off-the shelf products**
- **customized products & services**
- **Developments of subsystems, systems & facilities according to customers needs**
- **Education and Training Programs --- Universities and Industry**
- **High flexibility , reliable & fast**

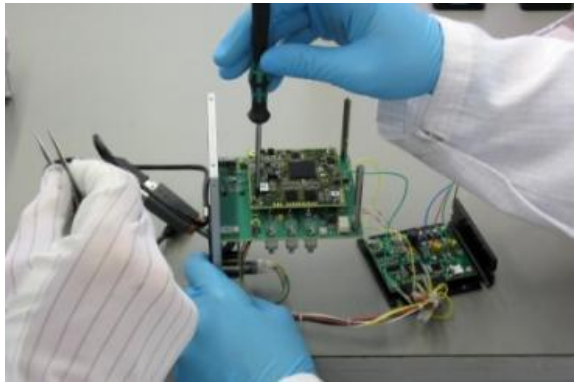
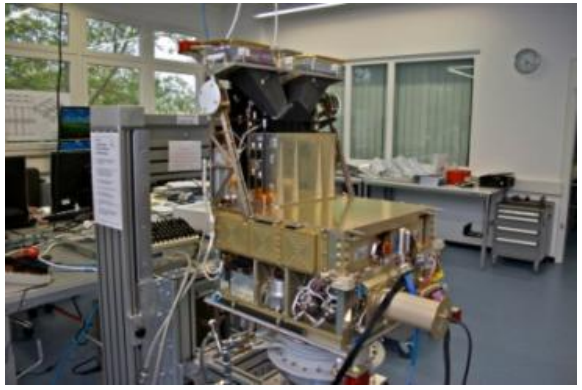





Astro- und Feinwerktechnik Adlershof GmbH

We are looking for:

- **Cooperation Partners**
  - Scientific partners to address the Space Agencies (DLR / JAXA)
  - **Global Climate Change -** Monitoring Trace Gases
  - Agriculture monitoring from space

- **Payload/Instrument Partners for Earth Observation and IoT**


Contact

Astro-
und Feinwerktechnik
Adlershof GmbH

Astro- und Feinwerktechnik Adlershof GmbH

Albert-Einstein- Str. 12
12489 Berlin
Germany

Phone +49-30-6392 1000
Fax +49-30-6392 1002

email: info@astrofein.com

www.astrofein.com

Backup Slides

Structures and Mechanism – Product: Launch Containers for NanoSats

The family of PSL is a flight proven deployment mechanism for CubeSats

- Deployer for 1U, 2U and 3U CubeSats and combinatio
- Flight proven unlock principle without pyrotechnics
- Redundancy in actuation and Telemetry

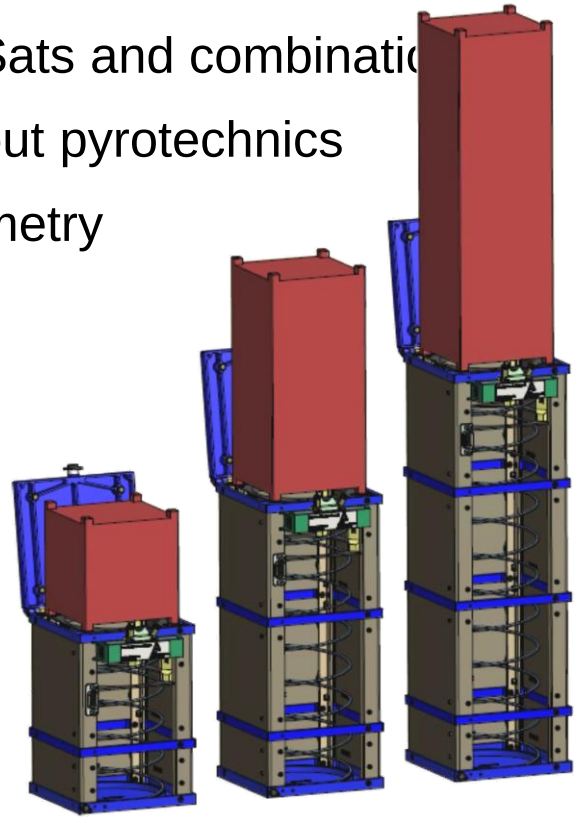
•Deployment is initiated if the door is

•completely opened and locked (patented)

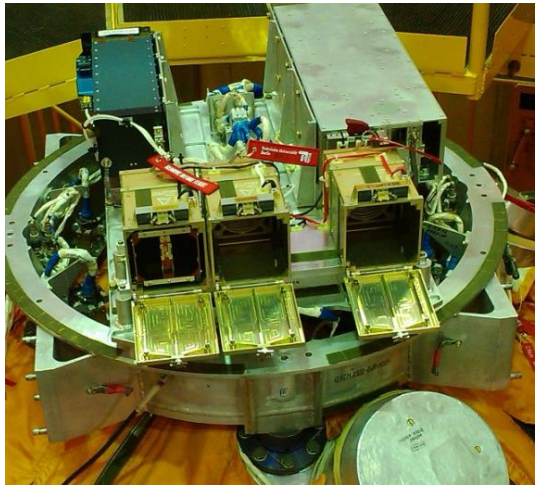
•patented Fixation of the CubeSat

• in X,Y and Z

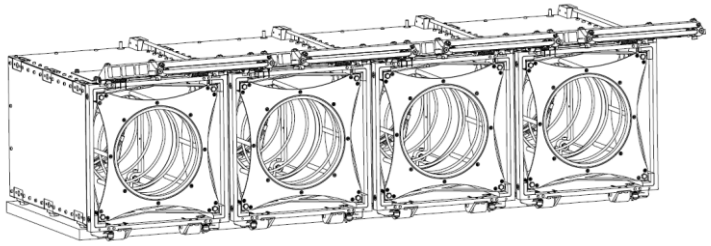
•Up to 20 kg mass



1U, 2U an d 3U Satellite Deployer (PSL – Product)



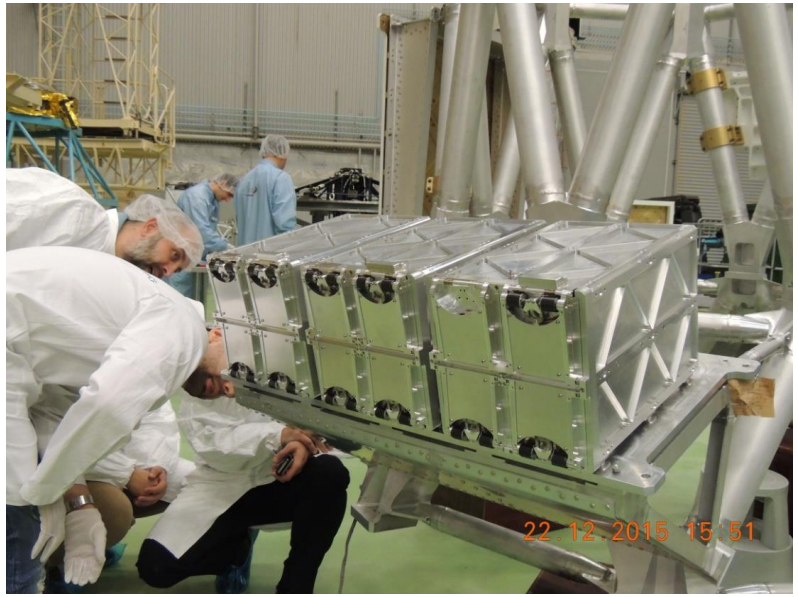
Three 1U SPL on the BION Spacecraft



10 kg Nanosat Deployer

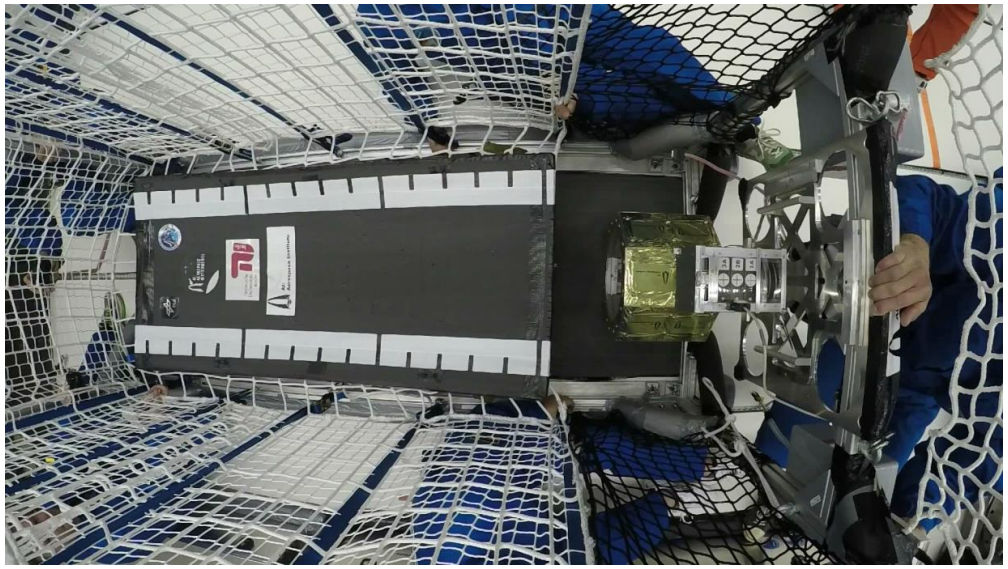
Product: Launch Containers for NanoSats

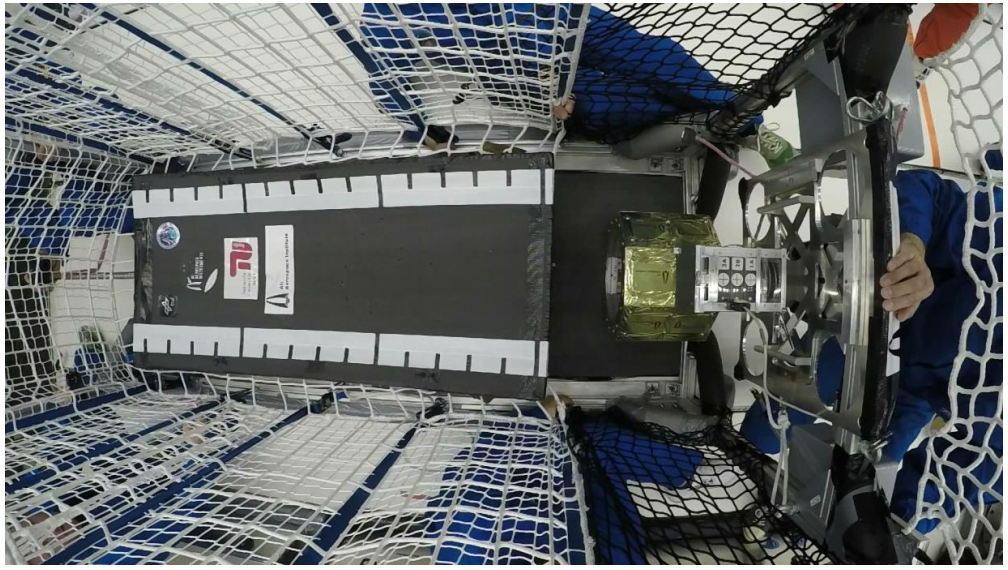
- **CubeSat Deployer PSL and PSL-P**
- **Recent Flight Heritage (excerpt):**
  - Maiden Flight of Chángzhēng 6 on Sept. 19th 2015;
  - Parabola Flight of the **PSL** TUPEX-5 in May 2015



Fit-Check on the Launch Vehicle

Chángzhēng – 6 (Long March)
Maiden Flight: 19th Sept. 2015





PSL-P Deployer