

GomSpace Presentation

3rd UNISEC Global Meeting

GomSpace at a Glance

- A space company situated in Denmark established in 2007
- Experienced management team with background in defense, cyber and space
- Has exported space hardware to customers in more than 45 countries spanning the globe
- Focus on product design, mission design and mission implementation
- Manufacturing with network of aerospace manufacturers (AS9100C QA)
- 35+ highly qualified international staff



Who do we Serve?

- Nanosat customers in various segments:
 - Technical universities in 35 countries
 - Ambitious science groups
 - National space agencies
 - Commercial businesses (start-ups)
 - Military and national authorities
- Flight Experience
 - >25 satellites launched with GomSpace hardware on-board
 - Representing >14 countries
 - No mission failure attributed to GomSpace provided hardware
 - GOMX-1 operating successfully in space since November 2013

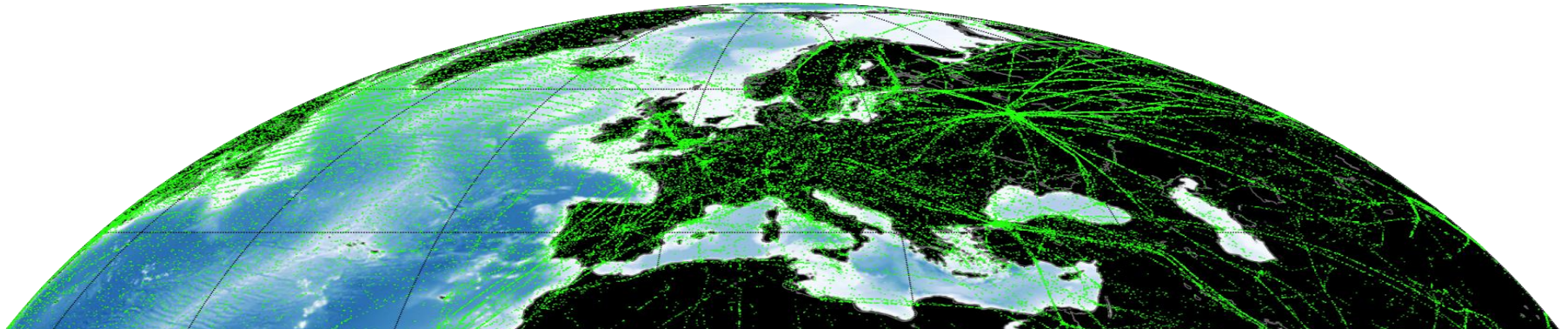
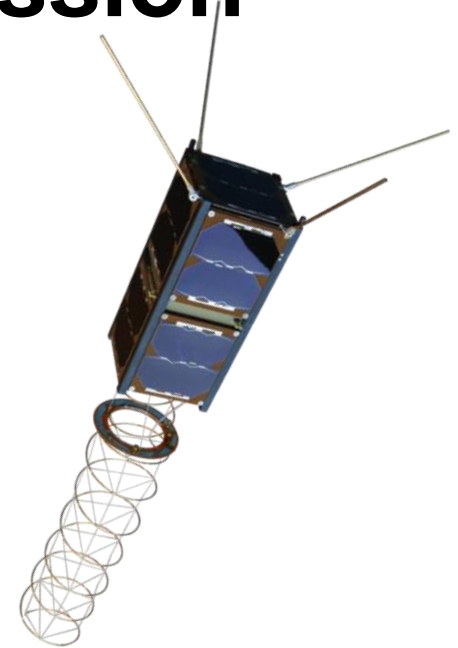


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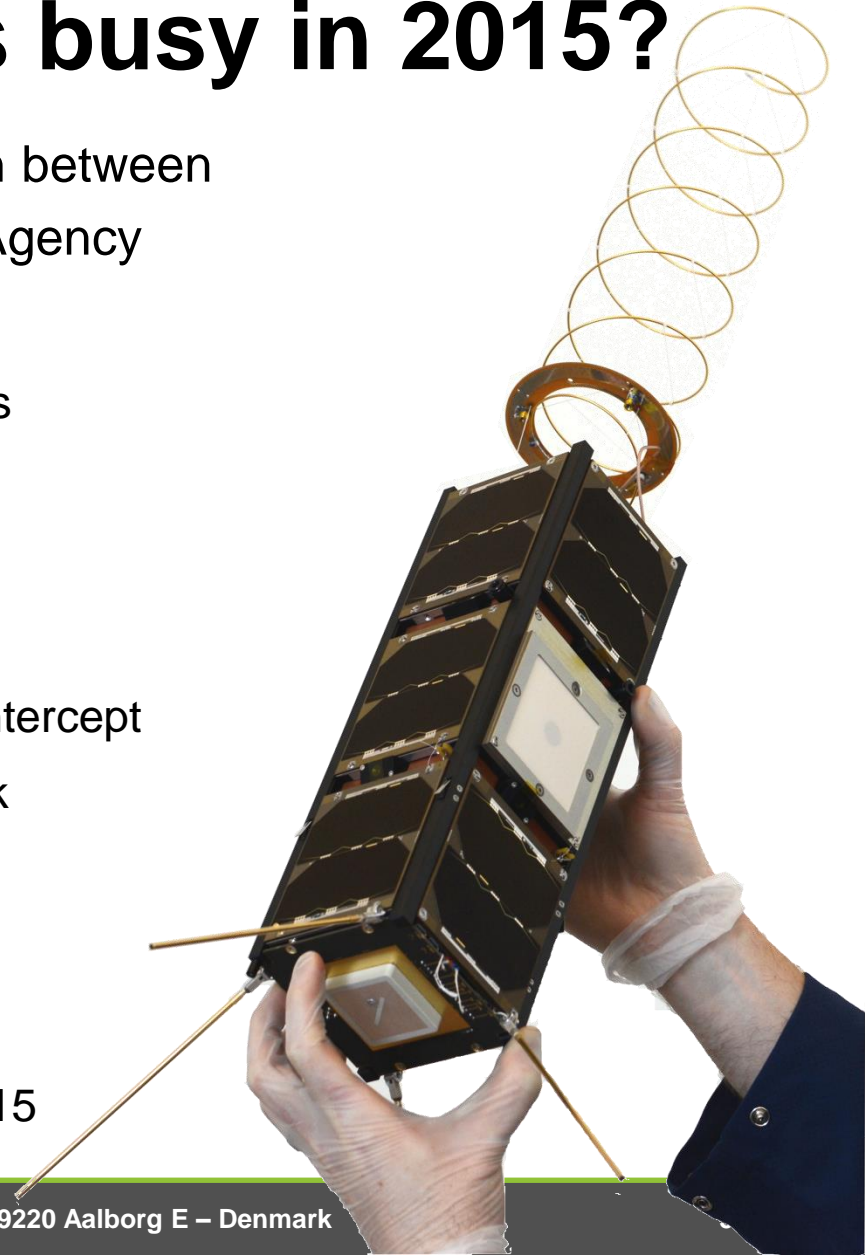
Example: Our GOMX-1 Mission

- 2 kg satellite launched in November 2013
- Based on GomSpace standard components
- Special designed ADS-B receiver payload
- Very successfully demonstrated global aircraft tracking
- Potential to reduce flight time, carbon emissions and to improve flight safety



What is keeping us busy in 2015?

- The GOMX-3 mission – a collaboration between GomSpace and the European Space Agency
- 3kg satellite platform:
 - New generation of GomSpace products
 - 2 degree pointing capability
- Payloads:
 - ADS-B receiver
 - L-band receiver for SATCOM signals intercept
 - X-band transmitter with 3 Mbit downlink
- Schedule:
 - Flight model delivery in June 2015
 - Launch to ISS in August 2015
 - Deployment in space in September 2015



GomSpace Products

- Power systems



- NanoPower P31U/S
- NanoPower BPX
- NanoPower P110 /U solar panels incl. custom design

- Mission Control Systems



- NanoMind AD712D

- Communication systems



- NanoCom 482C
- NanoCom Ant430
- NanoCom TNC modem

- ADCS

- Coarse ADCS SW

- Integration

- Interstage modules
- NanoHub

- Payloads

- NanoCam C1U

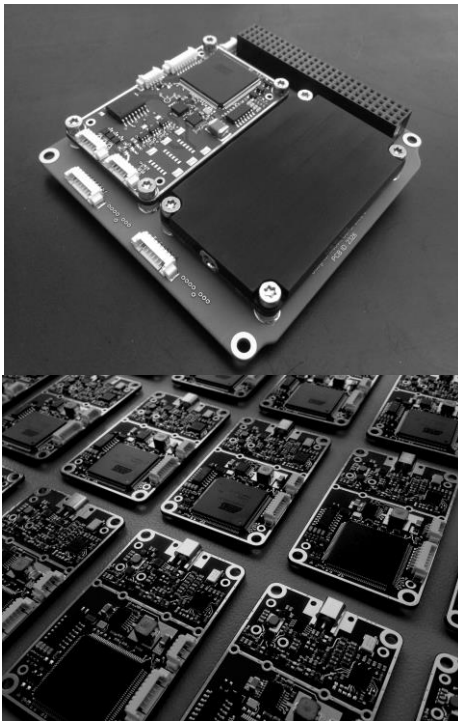


- Software

- CDH package

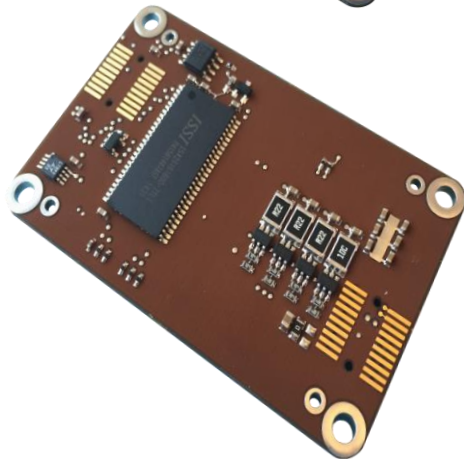
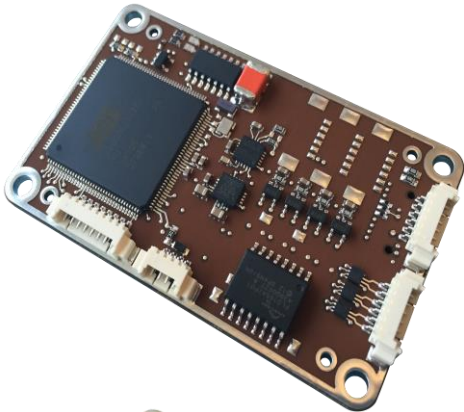
Next Generation

Faster and more resilient mission development and improved processing capabilities in smaller package



- ✓ Reduced size – room for redundant systems
- ✓ Shorter communication path between system critical modules
- ✓ More reliant tailoring to specific mission - NanoDoc board
- ✓ Series production of standard mission critical modules
- ✓ Software modularity and integrated parameter system
- ✓ Compatible with existing GomSpace key products
- ✓ Comprehensive portfolio of additional modules and payloads

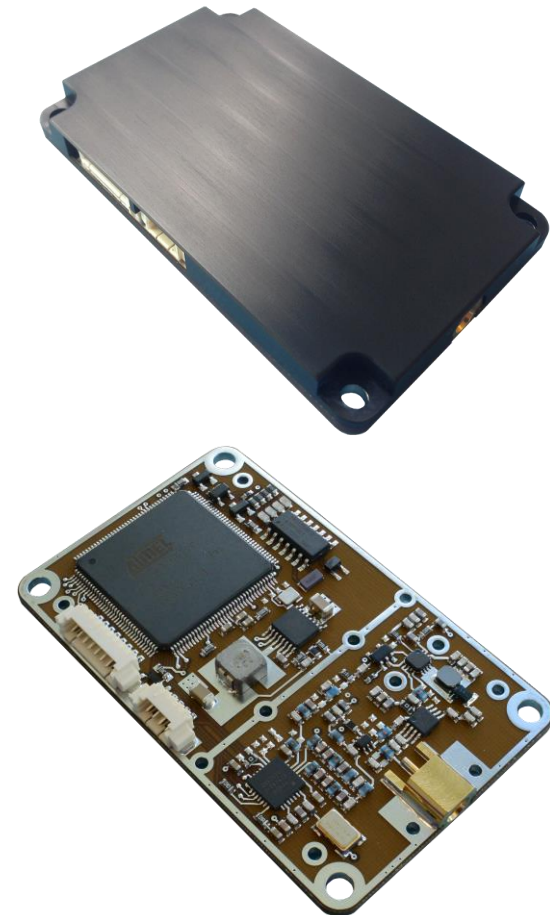
NanoMind A3200



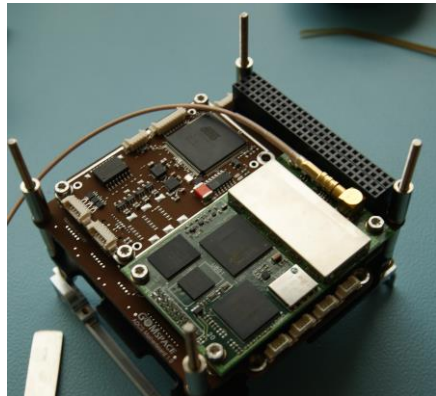
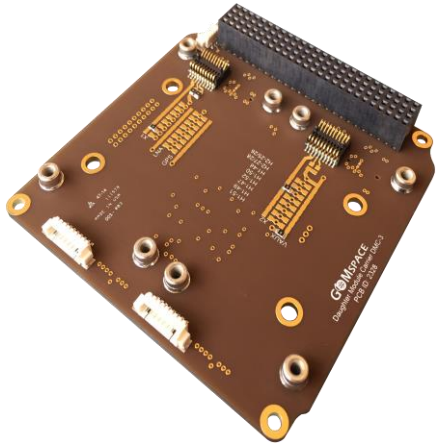
- High-performance AVR32 MCU with advanced power saving features
- Multiple CSP data interfaces: I²C, UART, (CAN-Bus)
- 32 kB FRAM for persistent configuration storage
- 32 MB SDRAM
- 8 external ADC channels that also can be used as GPIO
- Attitude stabilization system
 - 3-Axis magneto resistive sensor
 - 3-Axis gyroscope
 - 3 bidirectional PWM outputs with current measurements
 - I²C interface for GomSpace Sensor Bus (GSSB)
- New compact daughter-board form-factor
- Operational temperature: -40 C to +60 C

NanoCom AX100

- High Performance narrow-band transceiver for UHF and VHF bands
- Multiple CSP data interfaces: I²C, UART, (CAN-Bus)
- FSK/MSK/GFSK/GMSK
- Data rates from 0.5 kbps to 115.2 kbps
- Sensitivity down to -137 dBm
- RF carrier frequency programmable in 1 Hz steps
- Automatic frequency control (AFC)
- Transmitter with 30 dBm output power at > 45 % PAE
- compact daughter-board form-factor
- Operational temperature: -40 C to +60 C



NanoDock DMC-3



- Motherboard for up to 4 daughter boards
- Provision for mounting a NovAtel OEM615 GPS receiver (in place of 2 daughter boards)
- Operational temperature: -40 C to +85 C
- Dimensions: 91.9 mm x 88.7 mm x 8.6 mm
- 20-position FSI one-piece connector for daughter boards
- USB to UART console interface for easy use in lab setup
- ADCS version
 - Additional I/O for ADCS sensors and control
 - Support for reaction wheel control board

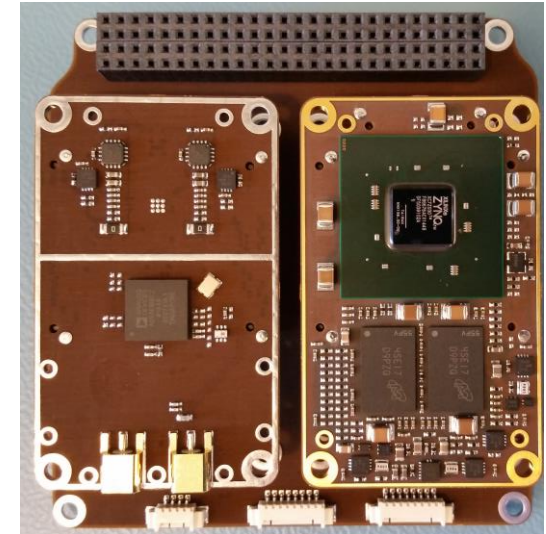
Upcoming: Software Defined Radio

- **Applications**

- Advanced multi node communications systems
- Spectrum monitoring and interference analysis
- Signal source location

- **Platform**

- Very Powerful FPGA
 - Dual ARM Cortex A9 MPCore (up to 1 GHz)
 - DSP blocks, 1 GB DDR3, up to 32GB storage
 - Linux operating system
- Mission specific RF modules
 - Dual Band 70 MHz - 6.0 GHz
 - Tuneable channel bandwidth: <200 kHz to 56 MHz
- Reprogrammable in orbit



NanoCom GS100

- 19" rack Ground Station with dual-radios for polarization diversity
- UHF and VHF versions available
- Internal Power Amp output 25W
- Data rates from 0.1 kbps to 115.2 kbps
- FSK/MSK/GFSK/GMSL modulation options
- Cubesat Space Protokol (CPS) and AX.25 support
- GS100L version for simplified lab testing



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