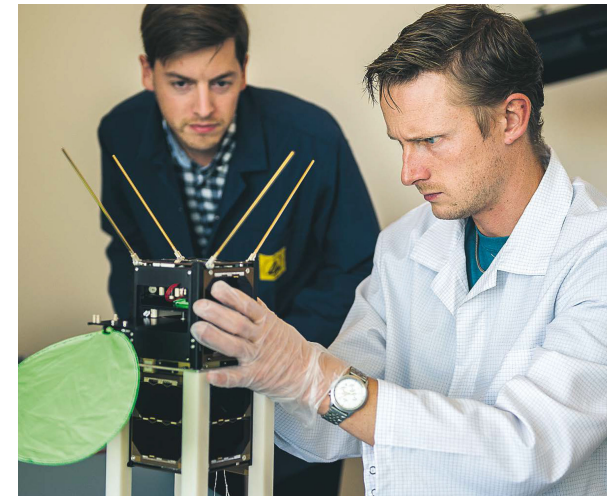


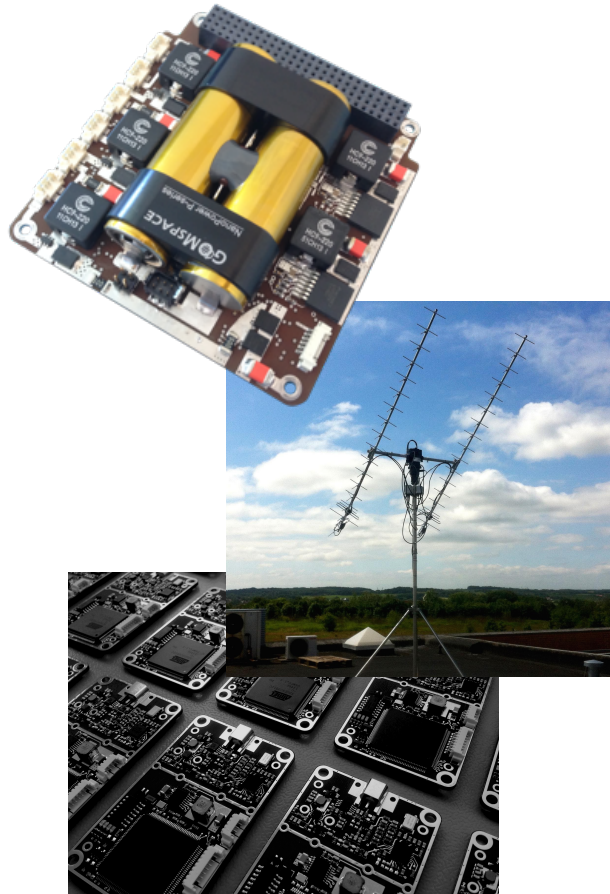
ITU Symposium Prague March 2-4

GomSpace at a Glance

- A space company situated in Denmark established in 2007
- Experienced management team with background in defence, cyber and space
- Has export of 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)
- 30+ highly qualified international staff



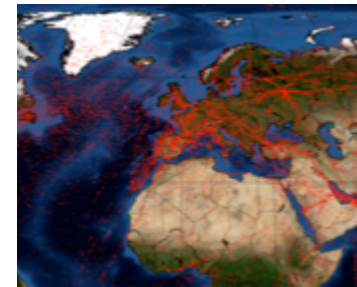
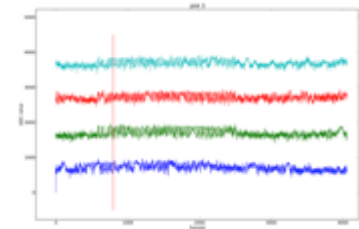
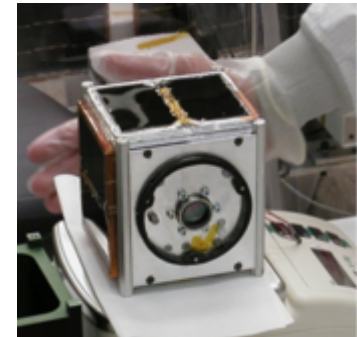
GomSpace Main Activities



- **Nano-Satellite Subsystems off the shelf**
 - Batteries, solar panels, power supply & distribution
 - On-board computers and software
 - Radio communication systems and antennas
 - Attitude control hardware and software
- **Complete nanosat platforms**
 - Reference platforms for payload integration by customers
 - Platform design, integration and test to customer requirements
- **Payloads**
 - Software defined radio technology and applications

Nano-Satellite Applications

- **First wave: Launch something into space**
 - Educational satellites, student satellites
 - Technological development
 - **Amateur-satellite service bands**
- **Second wave: Exploit new opportunities**
 - Small, non-critical, science missions
 - Demonstrate new applications of space
 - **Amateur-satellite service bands** – or Earth Exploration bands
- **Third wave: Mission critical services**
 - Monitoring & com for national security needs
 - Commercial applications and ambitious science missions
 - **Space radio service bands**



GOMX-1 Application Example

- **Platform**

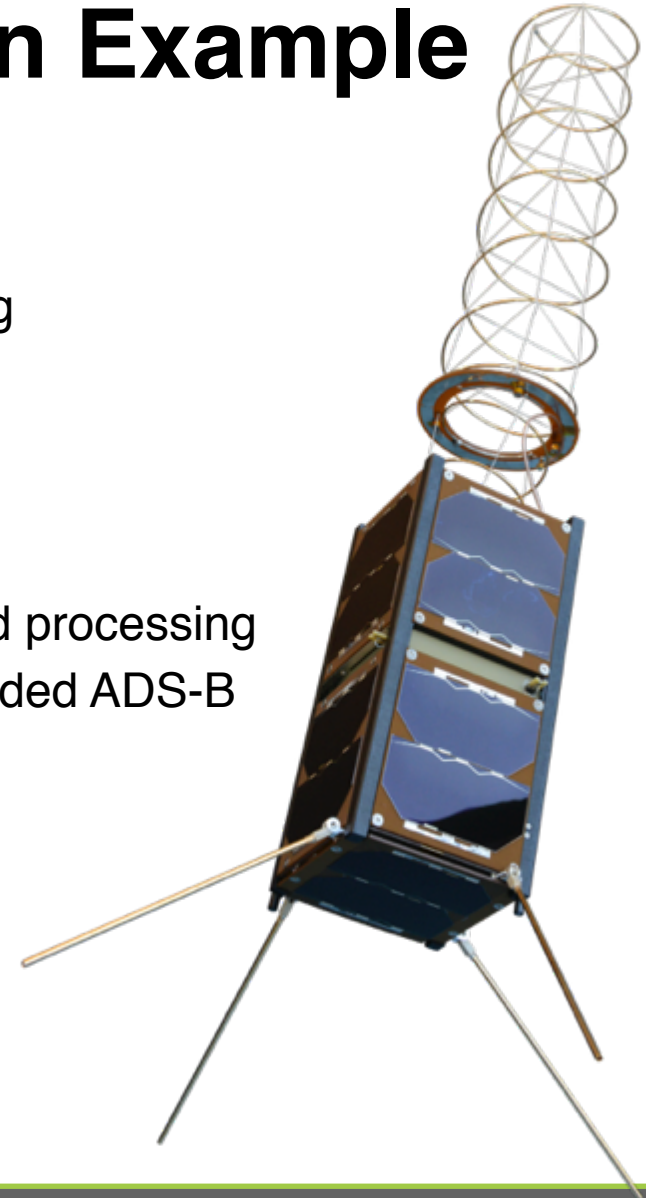
- Based on GomSpace's COTS port-folio
- 20x10x10 cm in stowed configuration. 2 kg
- 9k6 downlink in UHF

- **Payload**

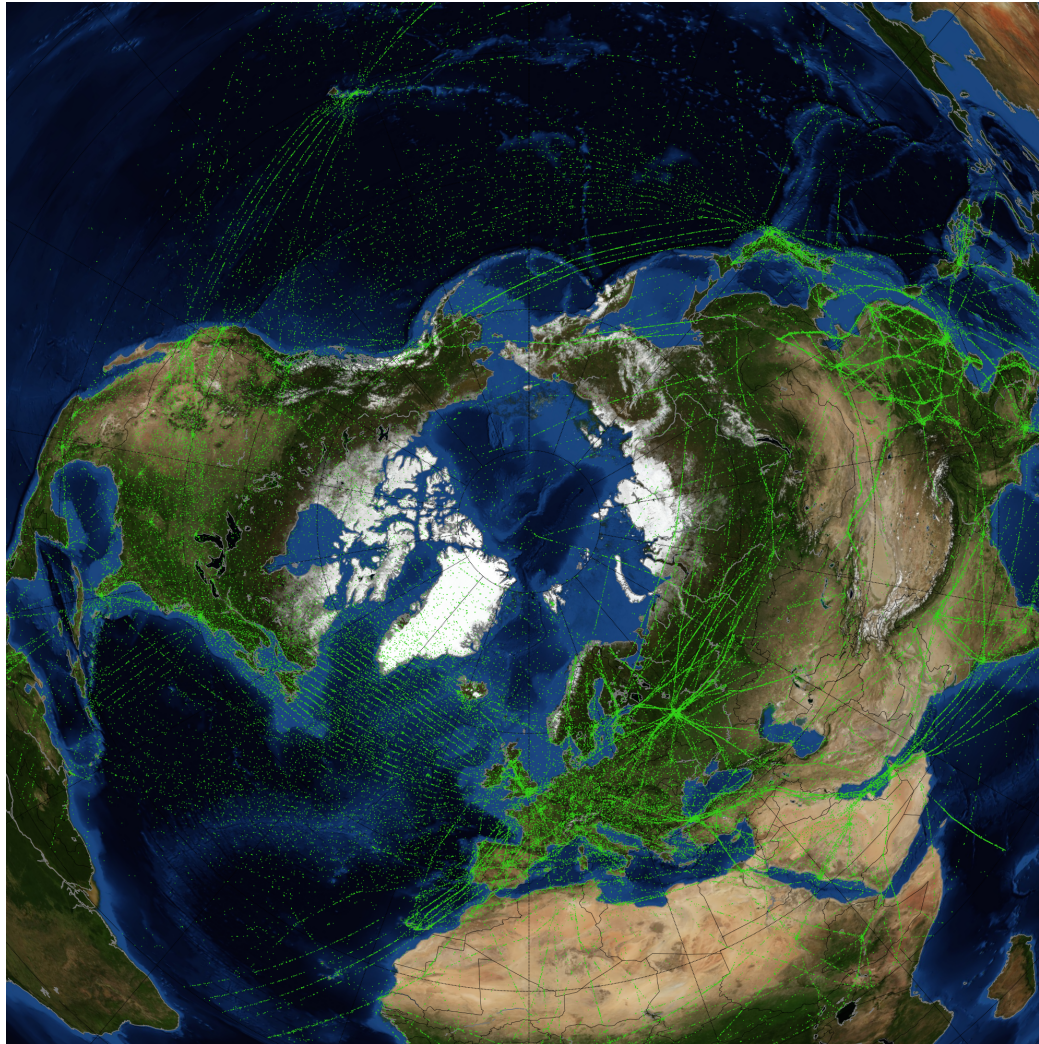
- Deployable helical antenna, ~10dBi
- Discrete front-end, FPGA based baseband processing
- On board database in uC of raw and decoded ADS-B
- FPGA and uC in orbit reconfigurable

- **Launch & Orbit**

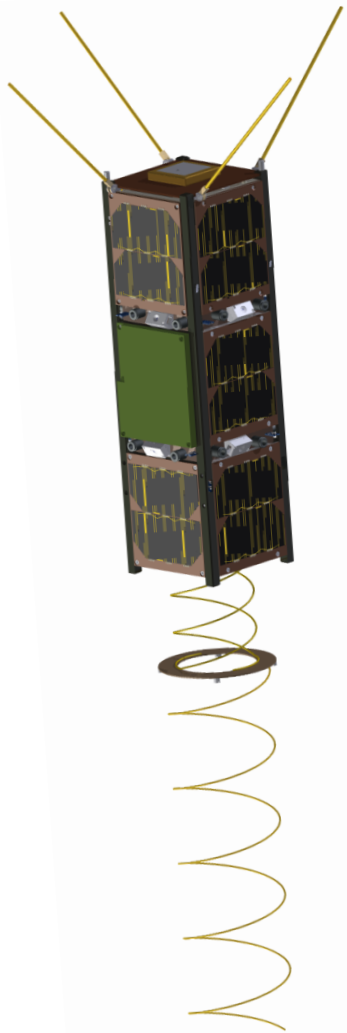
- Near SSO, 598km x 835km
- Launched by DNEPR in November 2013



GOMX-1 Results - Polar View



GOMX-3 Our Next Mission

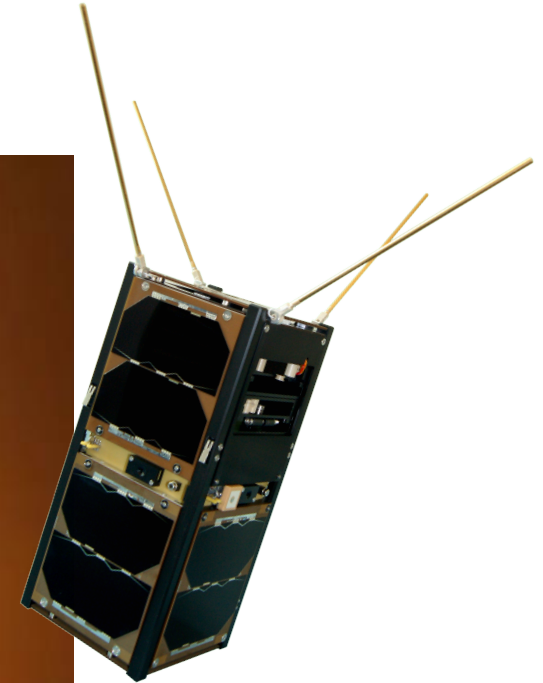


- Collaboration between GomSpace and ESA
- Satellite platform:
 - 3U with new GomSpace products
 - 1 degree pointing capability
- Payloads:
 - ADS-B 2nd generation receiver
 - L-band receiver for SATCOM signals intercept
 - X-band transmitter with 2MBPS downlink
- Schedule:
 - Launch to ISS in June 2015
 - Deployment in space September 2015



GOMX-2

- Never do a number "2"



VHF/UHF Radio

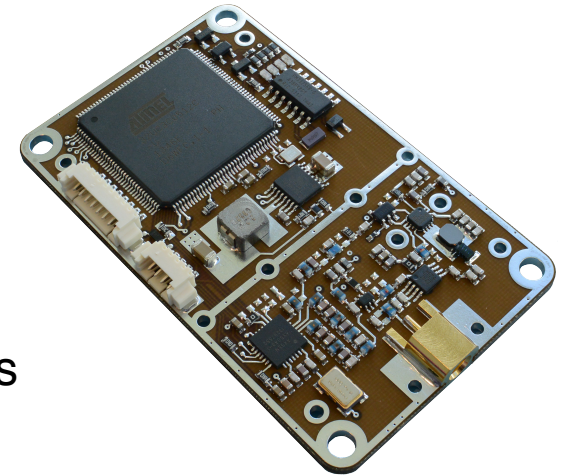
- **NanoCom U482C**

- 1200-9600 baud half duplex FM Radio
- UHF band with fixed frequency
- Flight heritage from several missions



- **NanoCom AX100/GS100**

- High Performance narrow-band transceiver for UHF and VHF bands
- 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



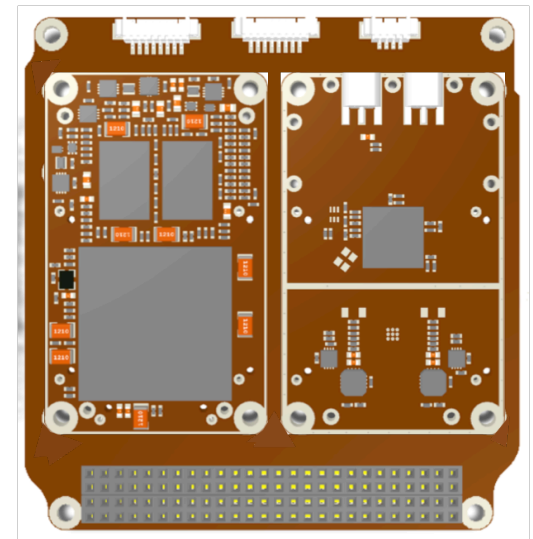
Software Defined Radio

- **Applications**

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

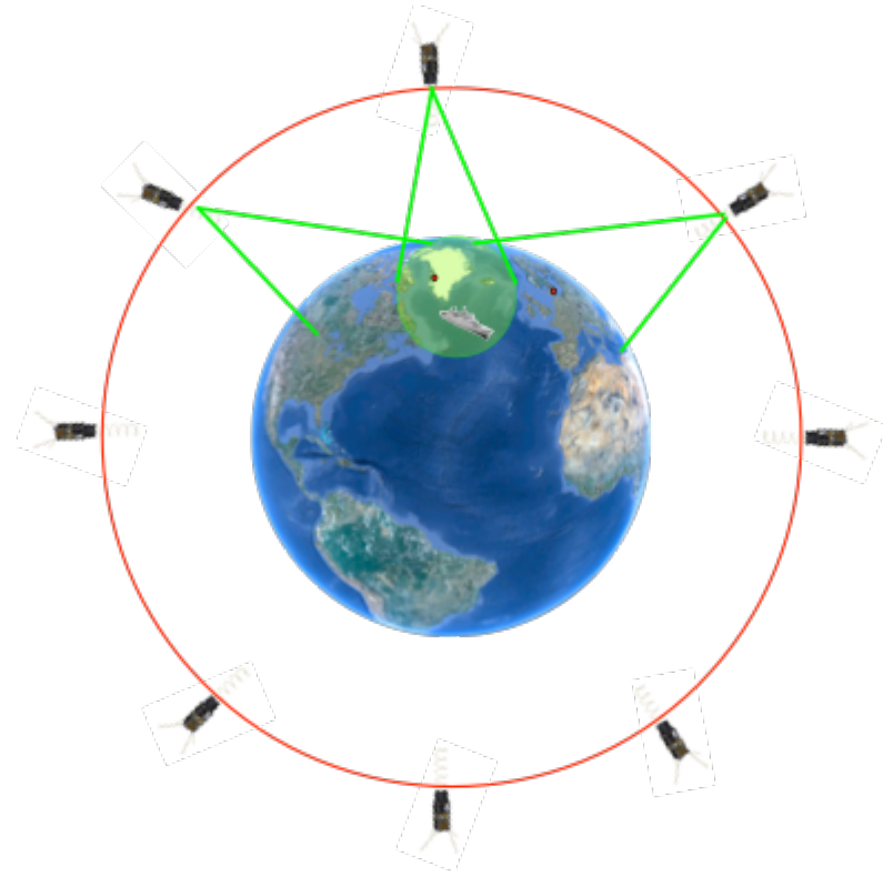
- **Platform**

- Xilinx Synq 7000 Series (7030 & 7045)
 - 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
- Full space qualification programme

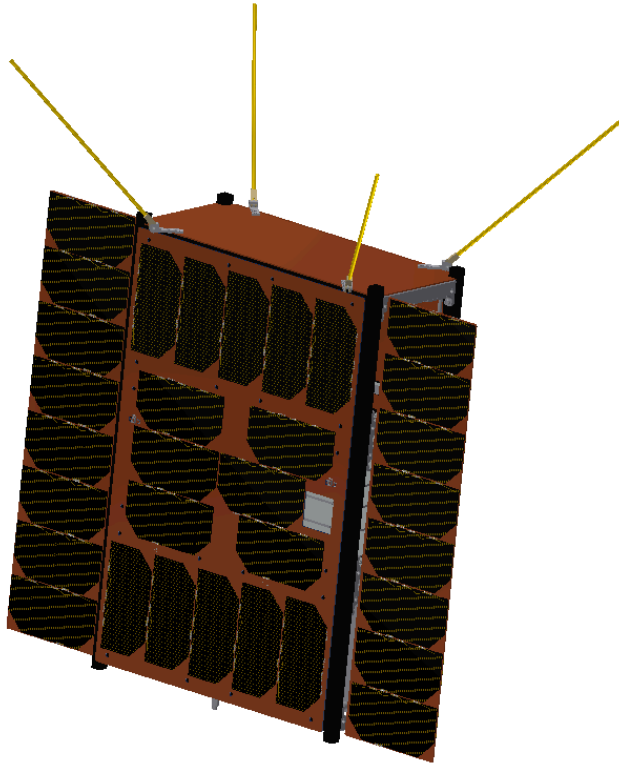


The Future - Missions

- **A network of Satellites**
 - 8-10 nanosats in polar orbit
 - 6-10 kg per satellite
 - Situational awareness and communication services
- **Characteristics**
 - Advanced propulsion and orbit control systems
 - Enhanced life-time in orbit 5-7 years



The Future – Communication Systems



- Satellite systems will have several communication systems
- Secure low-speed communication system for TT&C (omnidirectional)
- High speed data to ground segment(s) using directional antenna
- Inter satellite communication links
- **Objective** - Real-time communication between satellites and ground stations

Concluding Remarks

- Communication systems and bandwidth requirements increases
- Frequency Allocation process in the critical path for market success
- Looking forward to “challenge” the ITU system with 9 month frequency allocation process time
- Learn from terrestrial communication industry – congestion and interference handled through standardization
- GomSpace would like to join the work in standardization of communications systems and frequency allocation procedures



A photograph of a satellite component, possibly a camera or sensor, in space. The component is white and metallic, with various ports and connectors. It is positioned on the left side of the frame. In the background, the Earth's horizon is visible, showing a blue curve against the blackness of space. Three small, rectangular satellite components are visible in the distance, arranged in a diagonal line.

Thank You