VENTA-1: BASIS FOR EDUCATION, SCIENCE AND INDUSTRY DEVELOPMENT

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SEMW 2010, Vilnius, 08.10.2010.
REACH THE GOALS OTHERS ARE ONLY THINKING OF!
**GOAL:**
INTEGRATION OF LATVIAN SPACE CAPACITIES INTO THE EUROPE’S SPACE MARKET

**DEVELOPMENT OF SPACE TECHNOLOGIES IN LATVIA**

- **Preparation, pilot activities**
  - Pilot project 2008-2011
  - Key scientific institutions and companies
  - INTER-NATIONAL PARTNERS
  - Building of nano-satellite VENTA-1
  - STATE IMAGE DEVELOPMENT
    - (FDI, orders, partnership, products un services exported)

- **Basic capacity development**
  - Human resources to science and research
  - Short-term experts attracted
  - Development of space education
  - National funding programmes
  - ERDF: development of scientific infrastructure

- **Development stage**
  - Space Competence Centre
    - SPACE CLUSTER
    - INDUSTRY INFRASTRUCTURE IN VHTP
  - EU recognized competence, a profitable return to economics
  - INTEGRATION WITHIN ESA

**National Space Strategy**
(science, industry, social benefits)

**Increase of Scientific Institutions’ Capacity**

**Industry & Science Co-operation Development**
PILOT ACTIVITIES IN NANO-SATELLITE DEVELOPMENT
- “VENTA-1” PILOT PROJECT
- AIS APPLICATIONS
- TRAINING OF STUDENTS AND ENGINEERS

HUMAN RESOURCES: EDUCATION AND RESEARCH
- SATELLITE CONTROL CENTRE DEVELOPMENT (SIGNAL PROCESSING, MATHEMATIC MODELLING)
- DEVELOPMENT OF DOCTORAL DEGREE STUDIES IN SPACE IT
- DEVELOPMENT OF MASTERS DEGREE STUDIES IN ENGINEERING

INDUSTRY AND RESEARCH CENTRE
- INNOVATION CENTRE: INFRASTRUCTURE FOR FINE ELECTRONICS AND SMALL/MEDIUM SIZE SPACE PROJECTS
- DEVELOPMENT OF VIRAC ANTENNAS INFRASTRUCTURE
- EMC COMPETENCE CENTRE AND PROTOTYPING LABORATORY

STRATEGY AND POLICY
- LATVIAN SPACE TECHNOLOGY CENTRE STRATEGY DEVELOPMENT
- SPACE CLUSTER INITIATIVE
- SPACE WORKING GROUP, FOSTERING ESA COOPERATION AGREEMENT
- SPACE AWARENESS ACTIVITIES
CO-OPERATION PARTNERS AND PLAN

• SHORT-TERM: CO-OPERATION IN DEVELOPMENT OF SMALL SATELLITE VENTA-1 (2008-2011)
  - AIS RECEIVER AS THE MAIN PAYLOAD
  - BASED ON RUBIN PROGRAMME
    - SDR COMMUNICATION MODEL DEVELOPMENT
    - VIRAC RT-16 AS THE GROUND STATION
    - CO-OPERATION WITH DLR IN GROUND STATION SERVICES
    - EDUCATION OF STUDENTS AND ENGINEERS

• MIDDLE-TERM (2012-): PARTICIPATION IN PRODUCT DEVELOPMENT
  - AIS SERVICE PRODUCTS DEVELOPMENT AND IMPLEMENTATION
  - SYSTEM PRODUCTS DEVELOPMENT
VENTA-1: PARTNERSHIP

VENTSPILS HIGH TECHNOLOGY PARK

VENTSPILS UNIVERSITY COLLEGE

UNIVERSITY OF APPLIED SCIENCES BREMEN

University Nanosatellite from Bremen for Maritime Space and AIS Technology Development AISat
# VENTA-1

<table>
<thead>
<tr>
<th><strong>MISSION</strong></th>
<th>AIS (AUTOMATIC IDENTIFICATION SYSTEM) DEVELOPMENT OF A NEW NANO-SATELLITE PLATFORM CONCEPT FOR TECHNOLOGY DEMONSTRATIONS AND PROTOTYPE MISSIONS</th>
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<tr>
<td><strong>LAUNCH DATE</strong></td>
<td>Q3 2011</td>
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<tr>
<td><strong>LAUNCHER</strong></td>
<td>PSLV, INDIA</td>
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<tr>
<td><strong>CLASS</strong></td>
<td>NANO-SATELLITE</td>
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<tr>
<td><strong>WEIGHT</strong></td>
<td>10 KG</td>
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<td><strong>ORBIT</strong></td>
<td>600KM</td>
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<td><strong>TYPE</strong></td>
<td>COMMUNICATION, NAVIGATION</td>
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</table>
| **PAYLOADS** | **MAIN:** AIS DATA RECEIVER, Plug-and-Play TECHNOLOGY DEMONSTRATOR  
**SECONDARY:** LASER RANGING RETRO-REFLECTOR, GPS RECEIVER, LOW RESOLUTION CAMERA |
DESIGN OF VENTA-1: QuadSat concept

Based on Quadsat design developed at the University of Applied Science Bremen (similar to AISat spacecraft for DLR Institute of Space Systems, Bremen)

- Core model dimensions: 250x250x25mm (one stack)
- Total mass: 10 KG
- Gravity gradient assisted by magnetic torquers and a small RW

- Power system voltage: 13..16V
- TM-TC System via UHG, S-Band and Orbcomm intersatellite links

Spacecraft bus design

Bus subsystems overview
WHY AIS?

AIS – AUTOMATIC IDENTIFICATION SYSTEM (MARITIME)

GLOBAL INFORMATION SYSTEM IS POSSIBLE ONLY VIA SPACE BASED RECEIVERS

SEVERAL ONGOING SPACE BASED AIS ACTIVITIES IN EUROPE AND WORLDWIDE (e.g. EU and ESA AIS studies, OHB, LuxSpace, Orbcomm, ComDev AIS missions in LEO)

AIS PAYLOAD ON VENTA-1 WOULD CONTRIBUTE TO THE SPACE BASED AIS TECHNOLOGY DEVELOPMENT, DATA SERVICES AND APPLICATION DEVELOPMENT

Example of AIS data from Rubin-7-AIS Mission (02.06.2008 – 19.11.2009)

Typical flight path for Venta-1

Principle of time-slots for AIS
Venta-1 satellite: first mission of QuadSat + Plug-and-Play technology tests

VENTA-1 Core Module

Space for co-passenger payloads

Enlarged Solar Array for additional payloads
VENTA-1

- Agreement concluded: 2008
- Training of engineers and students: 2009
- Venta-1 engineering model development and testing: 12.2010
- Swedish experiment of P-n-P technology: 2010
- Final design: 10kg
- Launch: Q3 2011 PSLV

Minimum design: 5kg

University Nanosatellite from Bremen for Maritime Space and AIS Technology Development AlSat
GROUND STATIONS (BREMEN&VENTSPILS: Irbene)

TM-TC System via UHG, S-Band and Orbcomm intersatellite links
SCIENCE & RESEARCH DEVELOPMENT

- A UNIQUE EUROPEAN INFRASTRUCTURE RT-32 AND RT-16
- THE ONLY ENGINEERING INSTITUTIONS ESTABLISHED FROM SCRATCH

VENTSPILS INTERNATIONAL RADIOASTRONOMY CENTRE (1994)

IZI "VSRC" 2010

ENGINEERING RESEARCH CENTRE (2006)

2010-2011

SPACE DATA PROCESSING CENTRE
VENTSPILS INTERNATIONAL RADIOASTRONOMY CENTRE

Holds and operates 32 meters and 16 meters parabolic antenas

Has expertise in radio astronomy: Weak signals, VLBI techniques, High performance computing

Is integrated in European VLBI network, Russian Low frequency VLBI network

Has gained world class experience in FP projects “RadioNet”, “EXPReS”, “NEXPReS”

Provides R&D services to public and private sector:
- Deep space missions
- Tracking of space debris
- GPS applications
- Rapid prototyping (electronics, mechanics)
- High performance computing/modelling

FUTURE PLANS: ~ 8 MILLION EUR INVESTMENT IN INFRASTRUCTURE AND HUMAN RESOURCES 2009-2012

To intensify contacts with ESA and other international institutions

Further and more qualified involvement in VLBI networks

Collaboration within Space debris networks

Act as ground station operators, incl. deep space missions
INFRASTRUCTURE FOR FINE ELECTRONICS AND SMALL/MEDIUM-SIZE SPACE PROJECTS:
ISO 7 CLEAN ROOM
Competence Centre: Space products development
6 mln. EUR 2011-2015

VENTA-2: SDR (PROGRAMME DEFINED RADIO) SPACE APPLICATIONS; QuadSat PLUG-and-PLAY CONCEPT DEVELOPMENT
FIRST SATELLITE TECHNOLOGY SUMMER SCHOOL ORGANIZED IN VENTSPILS: AUGUST 2010, >30 STUDENTS FROM THE 3 BALTIC STATES; REGULAR TRAINING OF ENGINEERS AND STUDENTS IN BREMEN
REACH THE GOALS OTHERS ARE ONLY THINKING OF!

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