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PAYLOADS FOR SUBORBITAL FLIGHTS
Microgravity
Present and Next Generation

Christian Lockowandt

Swedish Space Corporation

Next-Generation Suborbital Researchers Conference
February 18–20, 2010,
Boulder, Colorado

A comprehensive space industry

Space Systems

- Satellite systems
- Satellite payloads

Science Services

- Rocket systems
- Payloads
- Rocket & balloon launch services

Aerospace Services

- Flight test services

Satellite Operations

- Satellite control
- Satellite communication
- Data reception
- Teleport services
- Engineering services

Airborne Systems

- Airborne maritime surveillance systems

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Science Services division

Experiment Payloads

Sounding Rockets
Parabolic Flights
Space Shuttle
Balloons

Sounding Rockets

Programs and Systems

Balloons

Programs and Systems

Launch Service

Rocket and balloon launch services
Flight test services

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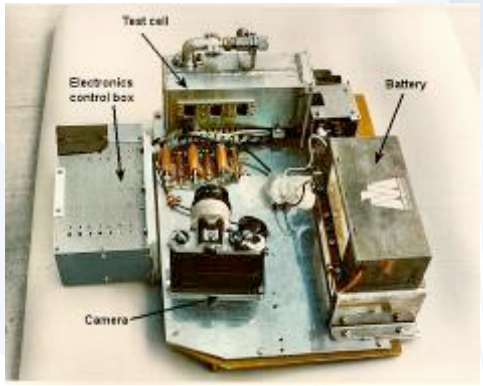
Swedish microgravity experiment flown on a NASA Starfighter 1982

- ~1 minute of microgravity, 10^{-2}g
- 2-3 flights per day,3 flight days
- Total ~8 minutes of microgravity
- Study the mechanism of pore growth in metal foam
- Hamid Shahani, Department of Casting of Metals at the Royal Institute of Technology in Stockholm in co-operation with SSC and NASA. Project sponsored by the Swedish National Space Board



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Sounding rockets

- Fine tuned tool used for at least 40 years for microgravity experiments
- Short turn around time, 1-2 years
- Excellent microgravity levels, 10^{-5}g
- Real time monitoring and control of experiment
- Late access, direct access to experiment hardware minutes before launch
- Early recovery of payload by helicopter, 1-2 h after lift-off
- Undemanding safety requirements
- Uncomplicated interfaces
- High flexibility
- Relative low cost (roughly 4 k$/lb for 6 min.)
- Experiment dedicated facilities

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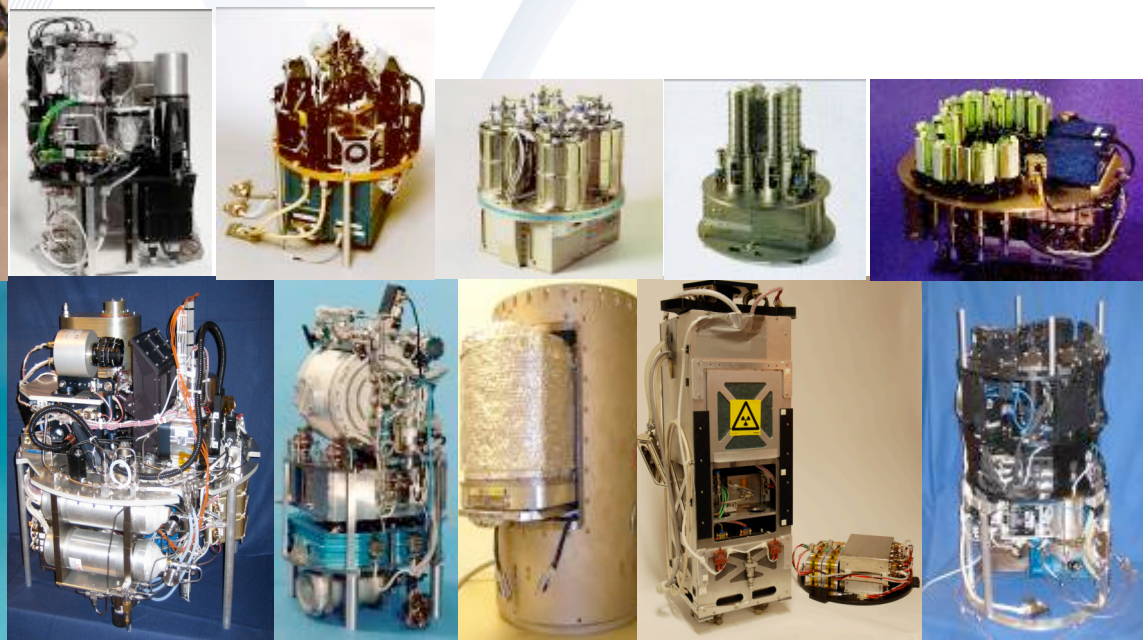
Experiment payloads

- Development of scientific payloads
- Close collaboration with scientists
- Experience in various research applications
- Sounding Rocket, Parabolic flights, Space shuttle, Satellite, Balloon



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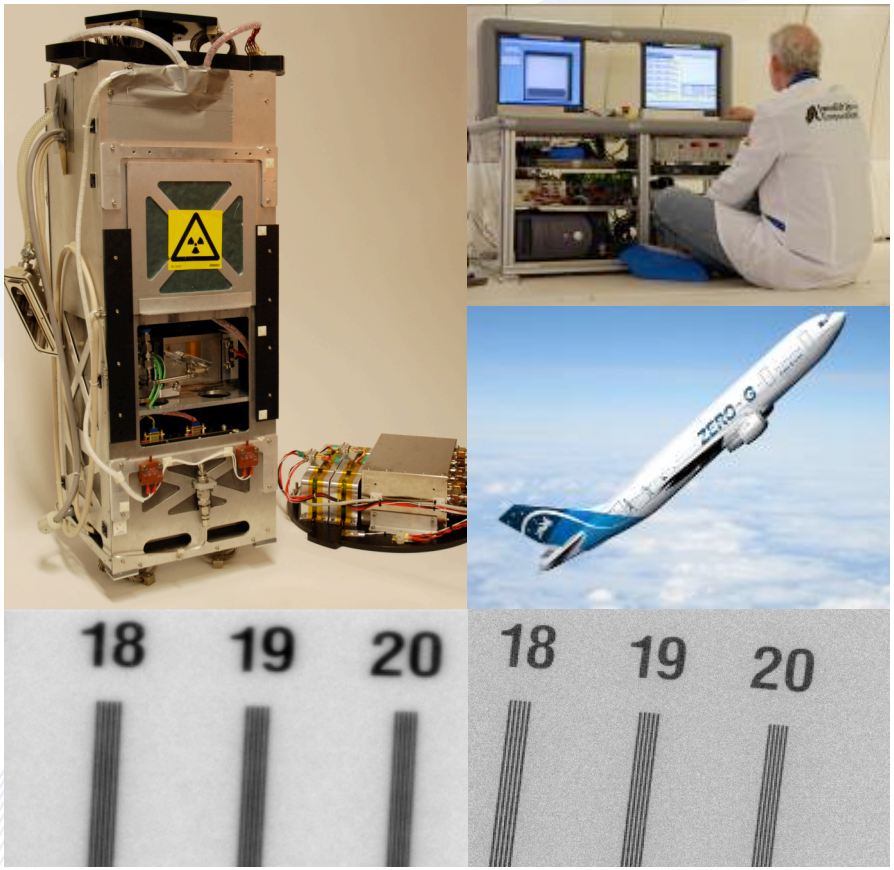
X-ray Diagnostic System

- Metallurgical experiments
- In-situ observation of samples with X-ray source and detector
- 3 images/second
- 5 Mpixel resolution
- New patent scintillator for higher resolution

- Record:
  1 sounding rocket flight, 2008
  2 parabolic flights, 2007, 2009
- Planned flights:
  2 sounding rocket flights, 2010 and 2011



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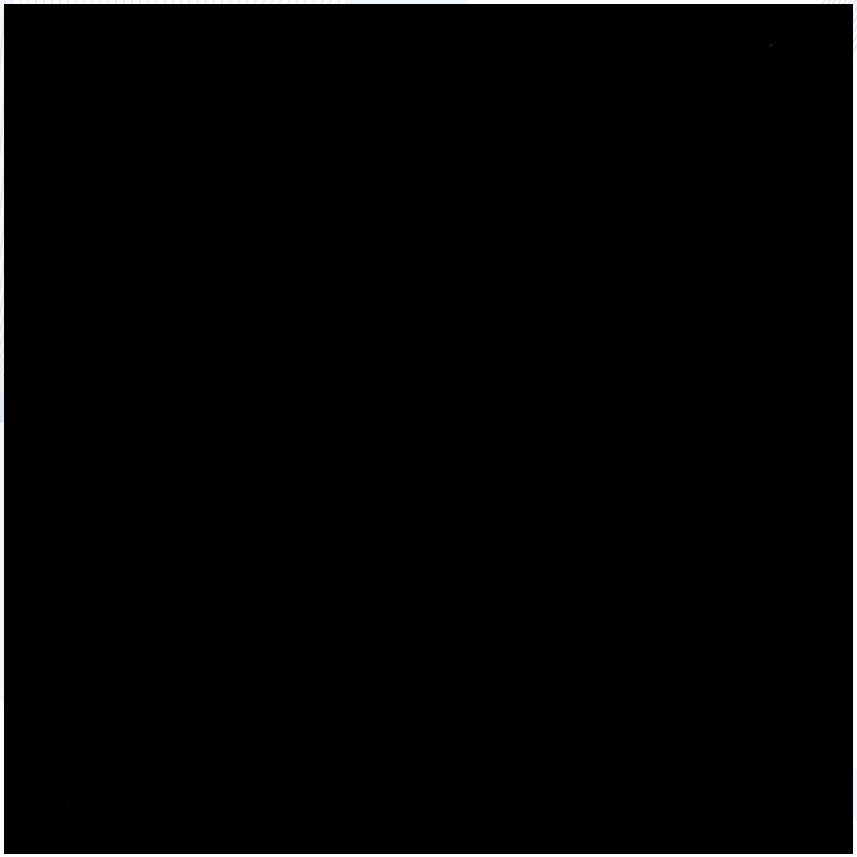
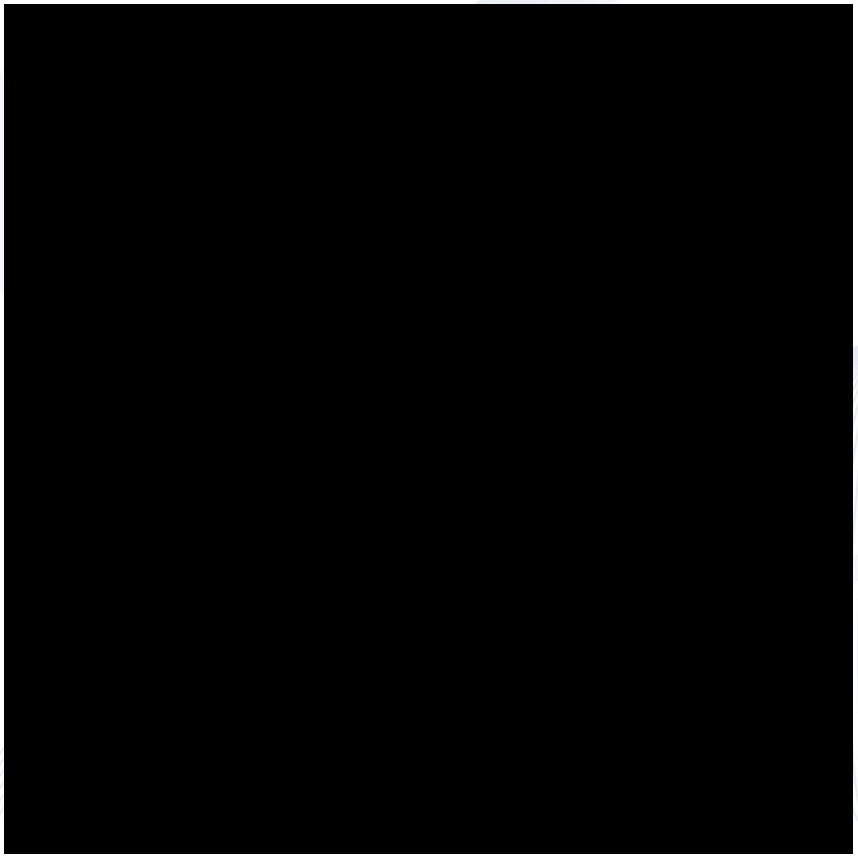
MASER 11 – X-ray radioscopy analysis

1g



microgravity



replay x25

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MASER Microgravity rocket program

- First launch 1987
- 11 (of 11) successful launches
- 50 experiments performed
- ESA major customer
- Apogee: 250-320 km
- Microgravity time: 6-8 minutes
- Microgravity levels:< 1x10-4g
- Payload mass: up to 400 kg
- MASER 12 scheduled for May 2011

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MAXUS Microgravity Rocket Program

- The MAXUS program joint venture between SSC and EADS Astrium Germany
- The MAXUS microgravity rocket program started 1991
- ESA major customer
- 7 successful launches, MAXUS 8 planned launch in March 2010
- Single stage motor Castor IVB
- Thrust Vector controlled system
- Apogee: over 700 km
- Microgravity: up to 14 min.
- Payload mass: up to 785 kg

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Microgravity payload recommendations

- Microgravity requirements variable for different experiments, user not always very familiar with environment
- Quick response time in many experiment makes short microgravity time useful (even in biological experiments)
- Interactive possibility with data/command/video link essential and maximises experiment payload (no onboard operator)
- Repetitive possibility of experiment for faster results
- Team with payload developer and scientific user

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MASER 11 Flight

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We simply enjoy a good challenge.
No challenge is too difficult.

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