

Microgravity Science Payloads for Suborbital Flights. C. Lockowandt and S Grahn, Swedish Space Corporation, Solna strandväg 86, 17104 Solna, Sweden, christian.lockowandt@ssc.se, sven.grahn@ssc.se

Introduction: The upcoming suborbital flights will offer a new possibility to perform experiments at an altitude around 100 km and in microgravity for approximately 3 minutes. The new concept also offers the possibility to repetitive flights, perhaps with two flights per day. The complexity of the experiment payloads could be compared with facilities used on parabolic flights and sounding rockets. Swedish Space Corporation is developing and operating experiment payloads for parabolic flights and sounding rockets since 30 years.

Microgravity experiments

Microgravity experiments that could be flown on piloted suborbital vehicles could be similar to those flown on sounding rockets and parabolic flights. For the flight sequence perhaps two flights per day may be envisaged. Also, an accompanying operator onboard will be subjected to high physical stress (up to 4 g acceleration) immediately prior to entering microgravity and starting the experiment. An operator will also occupy valuable space that could be used for more experiments. It is therefore probably prudent to adopt some of the methods used in sounding rockets where "telescience" has been used even during short six-minute flights. The experiment often has a built-in sequence that its onboard computer controls, but telecommand intervention from the ground is possible. The scientist on the ground watches the process via a television link and can modify the performance of the experiment. For a microgravity experiment on a piloted suborbital vehicle there could possibly be three alternative control methods: pre-programmed, by intervention through the onboard operator or from the ground. It is probably helpful for the onboard operator to at least get assistance from specialists the ground who should be able to watch the progress of the experiment via telemetry and/or a video link.

Some microgravity experiments could be flown as self-contained experiments that do not require an accompanying operator. Actually, such experiments resemble the Get-Away-Special payloads flown on the Shuttle and also the 60-second flights in microgravity offered by NASA in the 1980's. Experiments were then placed in the back seat of a NASA Starfighter jet flying out of Edwards AFB in California, see figure 2.

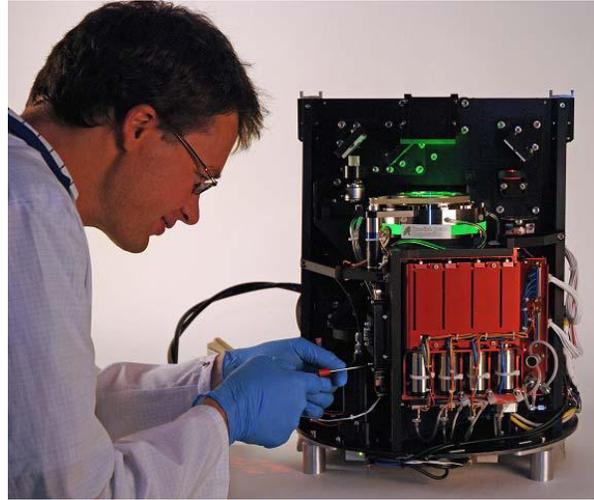


Figure 1: Experiment module developed and flown on sounding rocket (MASER 11 May 2008 from Esrange) by SSC. Experiment by Dr T Podgorski (CNRS, Grenoble, France) investigating blood cells flow motion in microgravity.



Figure 2: Pore-formation experiment flown in NASA F-104 jet at Dryden Flight Research Facility February 1982. Experiment by Dr Hamid Shahani Royal Institute of Technology, Stockholm, Sweden. Experiment developed by SSC. Left to right: S Wallin (SSC), S Ishmael (NASA), V Horton (NASA), H Shaha-ni (KTH).