I. Espace and the future of small satellites

The European Space Agency (ESA) has identified the need for dedicated launchers for small satellites which regularly launch into standardized orbits. The launch vehicle should be able to carry a payload of 100 to 150 kg to a 500-600 km Sun Synchronous Orbit and not use toxic propellants such as Hydrazine. Since the launches will take place all year around, the vehicle must withstand low temperatures and have a track record of at least three successful launches. If only one launch is made per year it occurs in August. If two launches are made they occur in April and August. Three launches per year occur in January, April and August. By using the launch service on three consecutive launches a constellation of satellites covering every local time can be established. Consequently, launches will occur with local times in the following succession: 0600, 2200, and 1400. If the demand for such constellation-building launches does not materialize the “dawn-dusk” orbit is offered as the standard orbit with the 2200 Local Time orbit as the fallback. If only one launch is made per year it occurs in August. If two launches are made they occur in April and August. Three launches per year occur in January, April and August. By using the launch service on three consecutive launches a constellation of satellites covering every local time can be established. Consequently, launches will occur with local times in the following succession: 0600, 2200, and 1400. If the demand for such constellation-building launches does not materialize the “dawn-dusk” orbit is offered as the standard orbit with the 2200 Local Time orbit as the fallback.

II. The need for access to space

Nano and microsatellites, including CubeSats and even minisatellites are today mainly launched as piggyback payloads with very limited opportunities to choose orbit or even knowing in which orbit the satellite will be placed. As the satellites and their applications get more sophisticated, the need to launch them into carefully designed orbits has arisen. There is already a queue of CubeSats looking for launch opportunities and we can expect a further increase in the future. Thus, there is a need for dedicated launchers for small satellites which regularly launch into standardized orbits. To meet these needs for access to space, SSC has initiated SmallSat Express, a launch capability for small satellites from SSC’s launching facility Esrange Space Center.

III. A launch service for small satellites - SmallSat Express

SmallSat Express will launch satellites 1 to 150 kg at pre-determined dates, one to four times per year and into a standard orbit. Cubesats are the main target payloads. The standard orbit is a sun-synchronous, “dawn-dusk” orbit at 500 km altitude and at the following local times of the ascending node: 2200, 0600 and 1400 (or 0000, 1800 and 0200). The 2200 Local Time orbit is very similar to those used by optical earth observation missions because satellites pass south-bound over targets on the ground at about 10 a.m. local time - the optimum time of day for taking pictures of the ground. The 1400 Local Time orbit is very similar to those used by optical earth observation missions because satellites pass north-bound over targets on the ground at about 2 p.m. local time - a local time used by weather satellites to get a close-up view of afternoon cloud cover to complement the 10 a.m. images. For satellites that desire a sun-synchronous orbit but are not engaged in optical imaging this is a perfectly viable alternative to the 10 a.m. orbit. The launch into the 0600 “dawn-dusk” orbit is proposed to occur in August giving eclipse-free conditions until the following spring - an advantage for power-starved missions.

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V. Smallsat Express - project status

A phase A study with the aim to investigate if a satellite launch service can be implemented at Esrange shows that it is technically feasible. A phase B1 study has recently been finalized which aimed for political endorsement, mainly in Sweden as well as obtaining data for the different launch vehicle options. As a result, the Swedish government has appointed a coordinator with the task to, on behalf of the government, take the project one step further by evaluating the business conditions. As a result of the A study, the Swedish government has appointed a coordinator with the task to, on behalf of the government, take the project one step further by evaluating the business conditions. The geographical position of Esrange Space Center is ideal for launching small satellites into polar orbits. A study has shown that it is technically feasible to implement a launch capability at the site. The facility already has a well-equipped infrastructure and experience of operations, range and launch safety as well as handling large rocket motors and launching of guided rockets. The present infrastructure and operational experience also make coordinated measurements using satellites, sounding rockets, balloons and/or ground instrumentation possible. The assessment of the launch vehicle options resulted in choosing the Brazilian/German VLM launcher as the base case. However, the final decision has not yet been taken and other launcher alternatives will still be considered.

VI. Conclusion

There is a need for dedicated launchers for small satellites. Cubesats in particular, which regularly launch into standardized orbits. The geographical position of Esrange Space Center is ideal for launching small satellites into polar orbits. A study has shown that it is technically feasible to implement a launch capability at the site. The facility already has a well-equipped infrastructure and experience of operations, range and launch safety as well as handling large rocket motors and launching of guided rockets. The present infrastructure and operational experience also make coordinated measurements using satellites, sounding rockets, balloons and/or ground instrumentation possible. The assessment of the launch vehicle options resulted in choosing the Brazilian/German VLM launcher as the base case. However, the final decision has not yet been taken and other launcher alternatives will still be considered.