ABSTRACT

Eurockot is the German-Russian joint venture company providing LEO launch services with the Russian ROCKOT launch vehicle. Eurockot Launch Services GmbH is a joint-venture, 51% of which is held by Astrium and 49% by Khrunichev State Research and Production Space Center, one of the leading space technology companies in Russia. The ROCKOT launch vehicle is a 3 stage liquid fuelled rocket based on the Russian SS-19 intercontinental ballistic missile. Rockot can place payloads of up to 1950 kilograms into low earth orbits (LEO) and has the capability to serve sun-synchronous, near polar and highly inclined orbits from its launch site at Plesetsk Cosmodrome in Northern Russia. The purpose of the paper is to describe the suitability of ROCKOT specifically for LEO earth observation and scientific missions. After successful launches of Grace and Iridium satellites in 2002 five further Launch Service Agreements are to be realised on the Rockot Launch Vehicle during next years, three of which were signed for launching Earth Observation Systems.

Eurockot, through its parents Astrium and Khrunichev has invested and upgraded the launch system including the launch site facilities and infrastructure. Through this investment, Eurockot has been able to maintain the historically high standard and reliability of Russian launch systems as well as mitigating the decay of existing Russian facilities which can occur due to lack of investment. Furthermore Eurockot is also able to offer to the Earth Observation market the necessary services that it needs, ranging from a modern reliable commercial launch vehicle Rockot as well as state-of-the-art facilities such as clean rooms and launch pad infrastructure which provide up to class 10 000 cleanliness conditions.

Following the successful debut of the Rockot commercial configuration during Eurockot’s Commercial Demonstration Flight (CDF) in 2000, a successful launch of two GRACE scientific satellites of DLR/NASA from Plesetsk Cosmodrome in Northern Russia was undertaken in March 2002. Eurockot carried out its first commercial mission by deploying the twin GRACE satellites into the specified orbit of 500 km at an inclination of 89 degrees under contract to the German Aerospace Centre DLR. GRACE (Gravity Recovery and Climate Experiment), is a joint NASA / DLR program with the aim to measure the earth’s gravitation field with a previously unmatched precision.
Three months later on 19th June 2002 Eurockot Launch Services GmbH announced the successful launch of two IRIDIUM spacecraft. Both spacecraft were deployed into the specified orbit of 650 km altitude and an inclination of 86.6 degrees. Designated "IS 2", the mission served the operational maintenance of the IRIDIUM constellation.

Following these two successful commercial flights, Eurockot’s next mission is scheduled for the second quarter 2003. This will be a multiple launch of the Canadian satellite MOST and Czech satellite MIMOSA together with 4 Nano-satellites from Canada (NLS – 1), the US (NLS – 2) and Japan (CUTE and CUBESAT XI). MOST and MIMOSA will perform scientific missions in LEO as a part of a multiple payload mission from Plesetsk Cosmodrome. The flight will demonstrate Rockot’s capability to inject satellites into various orbits during one flight: The launch of MOST will be the first sun-synchronous mission undertaken by Eurockot.

Eurockot is also under contract by the Japanese USEF organisation to launch the SERVIS-1 spacecraft in 4 Q 2003, by the European Space Agency to launch the CryoSat spacecraft in 2Q 2004 and by another Asian customer with an Earth Observation mission to launch his spacecraft into 98.13° 685 km orbit end 2004.

![Table 1: The performance of Rockot for circular orbits](image)
Figure 1: The logos of the various partners in the GRACE programme on the Rockot payload fairing prior to the successful launch on 17 March 2002.

Figure 2: The dual launch of the GRACE satellites by Rockot from Plesetsk Cosmodrome.
The Eurockot manifest so far lists the following launches:

1. 1 Dual Launch (Demonstration Flight)
   Simsat-1/-2 Simulators
   May 2000

2. 1 Dual Launch
   2 GRACE Spacecraft of DLR-NASA
   March 2002

3. 1 Dual Launch
   2 IRIDIUM Spacecraft
   June 2002

4. 1 Multiple Launch
   MOST (CSA), MIMOSA (Czech Rep.) plus various Nanosatellites
   (NLS – 1, NLS – 2, CUTE and CUBESAT XI)
   2 Q 2003

5. 1 Dedicated Launch
   SERVIS-1, USEF/METI/ Japan
   4 Q 2003

6. 1 Dedicated Launch
   CryoSat (ESA)
   June 2004

7. 1 Dedicated Launch
   EO mission (Asian customer)
   4Q 2004