

# 1. INTRODUCTION

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**Purpose** The purpose of the *Land Launch User's Guide* is to familiarize members of the customer community with the Land Launch system and associated services. This document is the starting point for understanding the Land Launch spacecraft integration process, Land Launch interfaces and the overall capabilities of the system. Land Launch services are provided by the Sea Launch Company, LLC, acting in cooperation with Space International Services, Ltd (SIS), and are marketed by Boeing Launch Services (BLS). Further information may be obtained by contacting BLS directly ([www.boeing.com/launch](http://www.boeing.com/launch)).

## 1.1 Overview of the Land Launch System

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**Overview** As its name implies, Land Launch is Sea Launch on land: the proven hardware, processes and people of Sea Launch shifted to a land-based launch site at the Baikonur Cosmodrome. Land Launch and Sea Launch complement each other by addressing different classes of payloads. Whereas Sea Launch is a heavy-lift launch system that delivers more than 6,000 kilograms to a geosynchronous transfer orbit (GTO) requiring less than 1500 meters/second to geostationary orbit (GEO), Land Launch is a medium-lift launch system that delivers 3,600 kg to an equivalent GTO. The difference in GTO performance is due to the change in launch site.

There are two Land Launch configurations:

- The Zenit-3SLB ("B" for Baikonur), a three-stage integrated launch vehicle (ILV) closely derived from the Sea Launch Zenit-3SL (Figure 1-1), is suited for delivering payloads to medium and high, circular and elliptical Earth orbits, including GTO and GEO, as well as escape trajectories.
- The Zenit-2SLB, a two-stage ILV based on the first two stages of the Sea Launch Zenit-3SL, is designed for delivering payloads to inclined low Earth circular and elliptical orbits.

This edition of the Land Launch User's Guide addresses a representative set of missions and launch services that can be cost-effectively accomplished with these two companion launch systems. Potential users are invited to complete the User Questionnaire (Appendix A) and return it to the address indicated therein.



*Figure 1-1. The Proven Sea Launch System Provides a Solid Foundation for Land Launch*

**What the system includes**

The standard Land Launch system comprises:

- The three-stage Zenit-3SLB launch vehicle
- The two-stage Zenit-2SLB launch vehicle
- The Zenit launch complex at Baikonur cosmodrome, and approved downrange stage and fairing impact zones
- Support facilities at Baikonur cosmodrome for ground processing of the spacecraft and launch vehicle including fueling, check-out, ILV assembly and launch
- Transportation equipment including rolling stock and thermostating systems for moving people and hardware between locations at Baikonur cosmodrome
- Tracking, meteorological and communications assets

A thorough summary of Land Launch interfaces, operations, services and facilities is provided herein as Appendix B: Land Launch Standard Offerings and Options.

**Advantages to the Customer**

Land Launch provides:

- The most mature flight hardware in its payload class, closely derived from the proven Sea Launch configuration. Maturity is greatest with the Land Launch upper stage, the venerable Block DM, which is the most experienced and reliable upper stage in any payload class with continuous service since 1974 on more than 220 missions with a demonstrated reliability exceeding 97%
- The versatility of the Block DM, which has the capability for multiple restarts, long duration missions, roll and coast maneuvers, accurate orbital insertion and tightly controlled SC separation parameters of motion and attitude
- Dedicated launch, eliminating schedule and technical risk associated with co-passengers
- Existing, operational, proven ground facilities
- The teamwork and proven expertise of the Land Launch partners, which include the same core companies that work together on Sea Launch
- The responsiveness of the world's only dedicated commercial launch services family: Sea Launch and Land Launch

**Timeline** It is expected that the first experience of a new spacecraft type can be integrated by eighteen months after contract signature. Repeat missions of the same spacecraft type can be integrated by twelve months after contract signature. Figure 1-2 provides a top-level summary of the relative mission phases, while more extensive details on the mission flow process are presented in Section 8.

Land Launch has the capability for conducting successive launches on 30-day centers at Baikonur. The vehicles are assembled off the launch complex, and the nominal time between vehicle roll-out and launch is on the order of twenty-eight hours, provided that spacecraft check-out on the pad does not exceed eighteen hours.

Land Launch is dedicated to reducing the time required for integrating and launching spacecraft. Deviations from the standard flows may be accommodated on a case-by-case basis, particularly for two-stage missions.

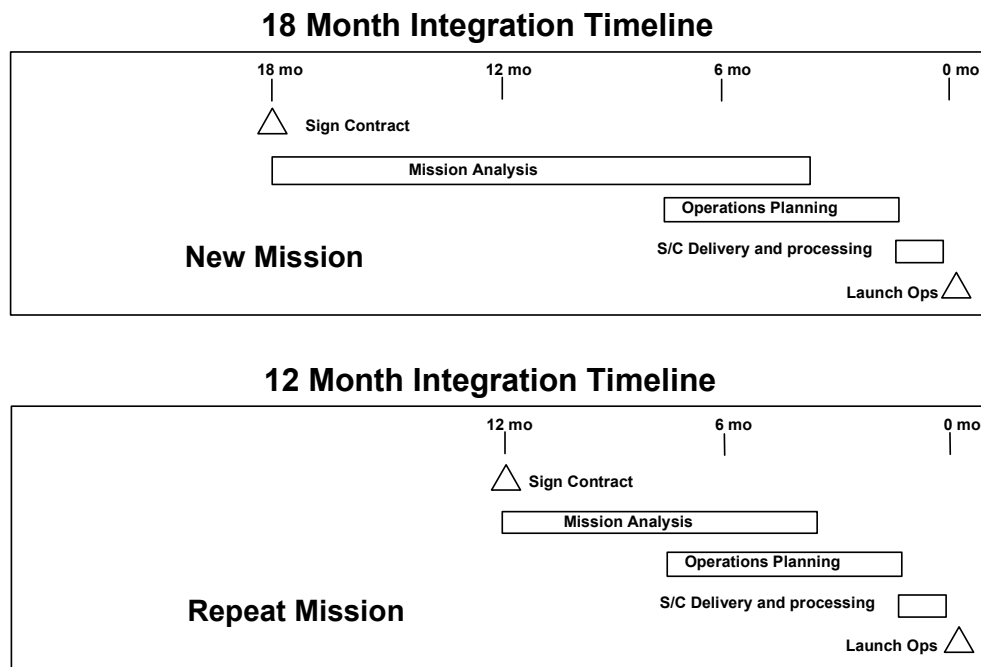


Figure 1 – 2. Land Launch Mission Integration Timelines Take Advantage of In-Place Sea Launch Procedures and Processes

**Baikonur  
Cosmodrome**

The Zenit Launch Complex is located at the Baikonur Cosmodrome in Kazakhstan at 63°E, 46°N (Figure 1-3). Baikonur was a primary launch site for the Soviet Union and, in the post-Soviet era, it continues to be the principal launch site for both the Russian and Ukrainian space industries.

Many of the greatest events of the Space Age have occurred at Baikonur including launch of the world's first satellite in 1957, the first mission (unmanned) to the moon in 1959 and the first manned launch in 1961. Thousands of other launches have taken place at Baikonur over the ensuing decades up to the present day. In recent years Baikonur has become an important commercial spaceport. Since 1995 there have been more than fifty launches of satellites made outside the Commonwealth of Independent States (CIS).

The cosmodrome is linked to major cities in the CIS by air, road and railway transport. The local area of the cosmodrome also has a developed road and railway network. The closest residential area is the city of Baikonur, located just south of the cosmodrome approximately 60 km from the Zenit Complex. Baikonur city lies on the north bank of the Syrdarya river. The Tyuratam settlement and the railway station of the same name (Kazakh railway) adjoin Baikonur. The Baikonur airport (Krainy) is linked to Moscow by regular and charter passenger flights and can accommodate most cargo and passenger airplanes. Spacecraft and cargo typically arrive via Yubileiny airport located within the cosmodrome itself.

The Zenit space rocket complex is the newest operational launch facility at Baikonur, and conducted its first launch in 1985. It is located far from large populated areas, ensuring safety of launches and allowing for easy allocation of impact zones. Furthermore, its position on the eastern side of the cosmodrome enables greater flexibility with respect to launch azimuths than other local launch complexes can offer.

The specific Baikonur cosmodrome facilities utilized by Land Launch are described more extensively in Section 6.



*Figure 1-3. The Baikonur Cosmodrome is Readily Accessible from Moscow*

## 1.2 Land Launch Organization

### Overview

Land Launch contracts will be managed by the existing Sea Launch organization in Long Beach, California. Such co-location and shared use of resources and personnel is key to enabling Land Launch to provide a “western” interface to its customers that is comparable to that experienced with Sea Launch. Launch services out of Baikonur are obtained via subcontract from Sea Launch to Space International Services, Ltd (SIS). SIS is a limited liability company based in Moscow consisting of key Land Launch members from Ukraine and Russia, all of which also participate in Sea Launch missions. The Land Launch organizational structure is presented in Figure 1- 4.

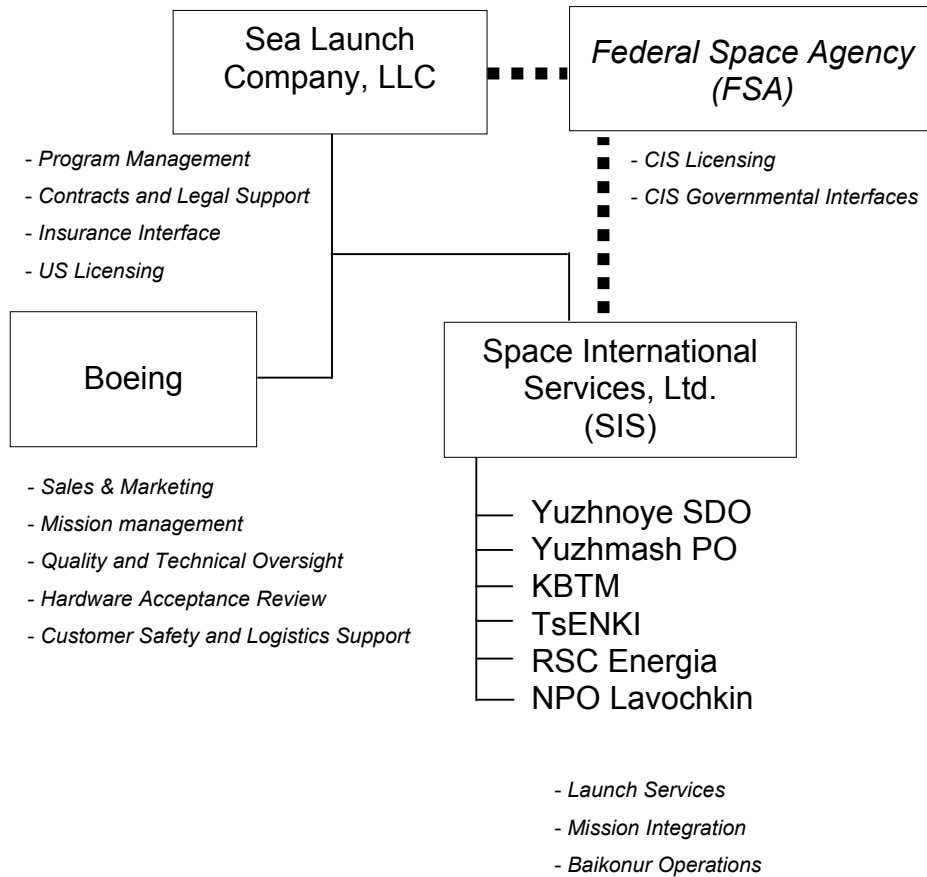


Figure 1-4. The Land Launch Program Brings Together an Experienced Team

**Sea Launch  
Company, LLC**

Sea Launch Company, LLC, headquartered in Long Beach, California, is the world leader in commercial heavy-lift launch services with its highly successful and innovative ocean-based launch system. Sea Launch is a partnership comprised of Boeing, RSC Energia, SDO Yuzhnoye, the Kvaerner Group and PO Yuzhmash. Additional information related specifically to Sea Launch can be found in the Sea Launch User's Guide and on the corporate website at: [www.sea-launch.com](http://www.sea-launch.com).

For the Land Launch service, Sea Launch responsibilities include:

- Management of the overall endeavor
  - Contracts & legal management
  - Insurance and financing interfaces
  - US licensing and US governmental interfaces
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**The Boeing  
Company**

The Boeing Company is enlisted by Sea Launch to provide the following capabilities on Land Launch missions:

- Mission management
  - Payload integration support
  - Hardware quality reviews
  - Overall technical and quality oversight
  - Satellite safety assessments and customer logistics support
  - Marketing & sales
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**Space  
International  
Services, Ltd**

Space International Services, Ltd (SIS) is a company comprised of SDO Yuzhnoye, PO Yuzhmash, RSC Energia, the Center for Ground Space Infrastructure Operations (TsENKI) and the Design Bureau of Transport Machinery (KBTM). Its office is in Moscow, Russia. SIS direct responsibilities include:

- Launch services and Baikonur operations
  - Supplier management (all CIS and launch hardware suppliers)
  - CIS licensing and regulation
  - Third party insurance
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**SDO Yuzhnoye**

SDO Yuzhnoye is the leading Ukrainian aerospace organization with vast experience in the design and development of launch vehicle technology. The company is established under the laws of Ukraine, with its principal place of business in Dnepropetrovsk, Ukraine. The SDO Yuzhnoye team along with that of PO Yuzhmash has conducted hundreds of successful launches from Baikonur (Fig. 1-5). Additional information related to SDO Yuzhnoye can be found on the website at: [www.yuzhnoye.dp.ua](http://www.yuzhnoye.dp.ua).

SDO Yuzhnoye performs the following work in support of the Land Launch program:

- Design and configuration management of the Zenit stages for both the Zenit-2SLB and Zenit-3SLB, as well as design support during their manufacturing
- Design of the Zenit-2SLB fairing and integrated launch vehicle (ILV) as a whole
- Systems engineering and integration
- Payload integration and mission analysis
- Technical management and participation in ILV processing and launch operations



*Figure 1-5. The Zenit Vehicle Reflects Five Decades of SDO Yuzhnoye and PO Yuzhmash Experience in Designing, Building and Operating Launch Vehicles*

### **PO Yuzhmash**

PO Yuzhmash is another leading Ukrainian aerospace enterprise having vast experience in the development and production of major launch vehicles. The company is incorporated under the laws of Ukraine and, like SDO Yuzhnoye, its principal place of business is in Dnepropetrovsk, Ukraine.

PO Yuzhmash performs the following work in support of the Land Launch program:

- Manufacturing of the first two stages, and the Zenit-2SLB fairing
- ILV integration
- Participation in ILV processing and launch operations

**Design Bureau of  
Transport  
Machinery  
(KBTM)**

The principal offices of KBTM are located in Moscow, Russia. In its fifty year history KBTM has designed numerous launch complexes including the Zenit complex at Baikonur (Figure 1-6), and also performs vehicle integration and launch operations. More than 900 orbital launches have been conducted from launch complexes built by KBTM. KBTM is a major subcontractor on the Sea Launch program responsible for ground support equipment maintenance including the transporter/erector. On Land Launch, KBTM will have overall responsibility for:

- ILV assembly area and launch complex
- ILV processing for launch
- Ground support equipment
- Launch operations



*Figure 1-6. KBTM Developed the ILV Transporter and Erector Equipment for both the Sea Launch and Land Launch Programs*

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**Center for Ground  
Space Infrastructure  
Operations  
(TsENKI)**

The principal offices of TsENKI are located in Moscow, Russia in close association with the Russian Space Agency. TsENKI is responsible for operation of the ground aerospace infrastructure facilities at Baikonur cosmodrome and downrange sites. TsENKI will have fundamental responsibility on Land Launch for:

- Russian launch licenses and third party insurance
  - Recording, acquisition and processing of telemetry data
  - Security and guard services
  - Telecommunication services and communication systems
  - Logistics support (propellant components and compressed gases)
  - Securing cosmodrome support services during ILV processing and launch
  - Processing operation and maintenance of impact zones
  - Coordinating electromagnetic compatibility for ILV processing and launch operations
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## RSC Energia

RSC Energia is the premier Russian space company. RSC Energia, developer of launch vehicles and propulsion systems, spacecraft, space stations, as well as manned and cargo modules, brings its legendary experience in space exploration and launch system integration to Land Launch. Energia is a joint stock company established under the laws of the Russian Federation, with its principal place of business in Korolev (near Moscow), Russia. Additional information related to RSC Energia can be obtained at: [www.energia.ru](http://www.energia.ru). Energia has the responsibility on Land Launch for:

- Design and manufacture of the Block DM-SLB upper stage (Figure 1-7)
- Integration of the Ascent Unit comprising the Block DM-SLB, fairing, adapter and spacecraft
- Mission analysis support
- Launch operations support
- Customer support



*Figure 1-7. Energia's Block DM is the Most Successful and Most Proven Upper Stage Available Today*

**NPO Lavochkin**

NPO Lavochkin is located in Khimki, Russia and has a distinguished history of achievement in the design, development and manufacture of aircraft, launch vehicle upper stages and spacecraft including many deep space missions to the moon, Venus and Mars. Lavochkin has also provided more than 100 fairings for various launch vehicles and will be providing Land Launch with a flight-proven fairing for the Zenit-3SLB.

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**Federal Space Agency**

Land Launch enjoys the support of the Federal Space Agency which will be providing Land Launch with the use of its facilities at Baikonur, launch licensing and associated regulatory support including relations with other CIS governments on whose territory Land Launch activities will be conducted.

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