INTERNATIONAL LAUNCH SERVICES

PROTON

Proton Breeze M

ILS

KHRUNICHEV STATE RESEARCH AND PRODUCTION SPACE CENTER

Experience ILS: Achieve Your Mission

QUALITY | PERFORMANCE | EXPERIENCE | DEDICATION

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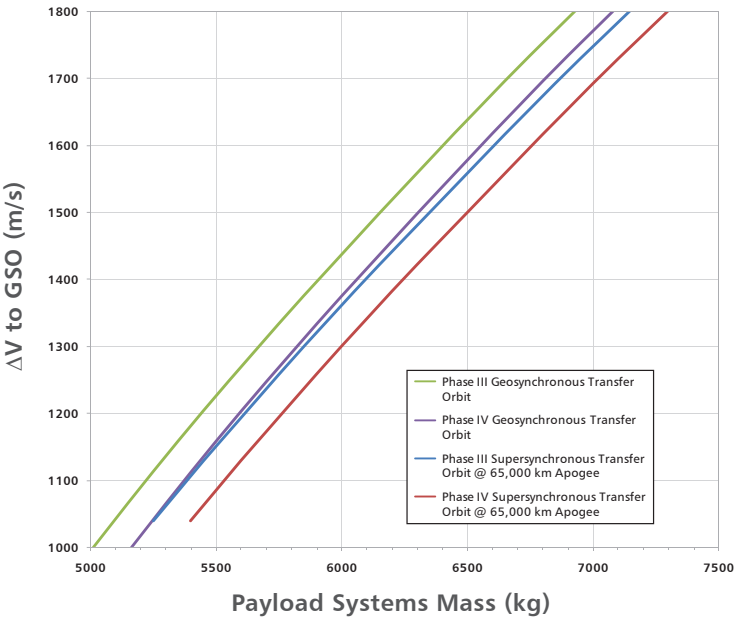
Proton Breeze M

With over 45 years of experience and over 360 flights, Proton is a proven, heritage system developed and built by Khrunichev State Research and Space Production Center (Khrunichev), Russia's premiere space manufacturer. International Launch Services (ILS), a U.S.-based company, has the exclusive rights to market the Proton vehicle commercially under the majority ownership of Khrunichev.

The ILS Proton Breeze M has the lift capability of over 6 metric tons to geosynchronous transfer orbit and is compatible with all major spacecraft platforms. With the flexibility for geosynchronous and supersynchronous transfer, highly elliptical and direct geostationary insertion mission, the Proton launch systems provides precise delivery to orbit in a robust, high performing package. The Phase IV Proton performance shown will be available starting in mid-2013.

PERFORMANCE



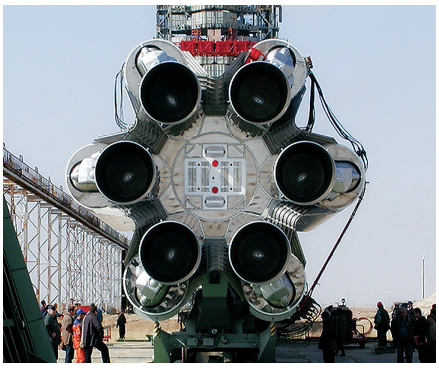
FEATURES

History:	More than 360 flights since 1965
Production:	Capability to support up to 14 missions per year
Suppliers:	Main components Russian-supplied
Typical Mission:	~9 hours utilizing 5-burn Breeze M mission design
Stages:	Three-stage Proton with restartable Breeze M upper stage
Avionics:	Closed-loop 3-string majority vote subsystem
Structure Type:	Monocoque
Materials:	Aluminum and composites
Propellants:	Nitrogen Tetroxide (N_2O_4) Unsymmetrical DiMethyl Hydrazine (UDMH)
Dimensions:	Length – ~60 meters, core diameter – ~4.1 meters

COMPATIBILITY

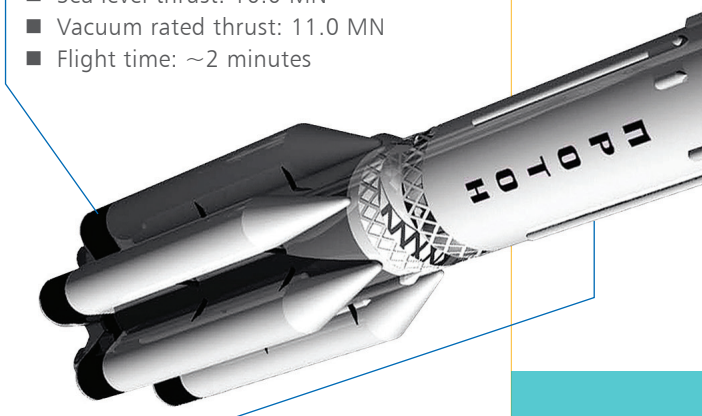
Satellite Bus	Compatible	Launched
601	•	•
702	•	•
A2100	•	•
E2000/3000	•	•
LS 1300	•	•
SB3000/4000	•	•
Star 2*	•	•
Express*	•	•
DS2000	•	

* Compatible with shared launches



FIRST STAGE

- Six RD-276 Liquid Rocket Engines — Khrunichev (Perm)
- Sea level thrust: 10.0 MN
- Vacuum rated thrust: 11.0 MN
- Flight time: ~2 minutes

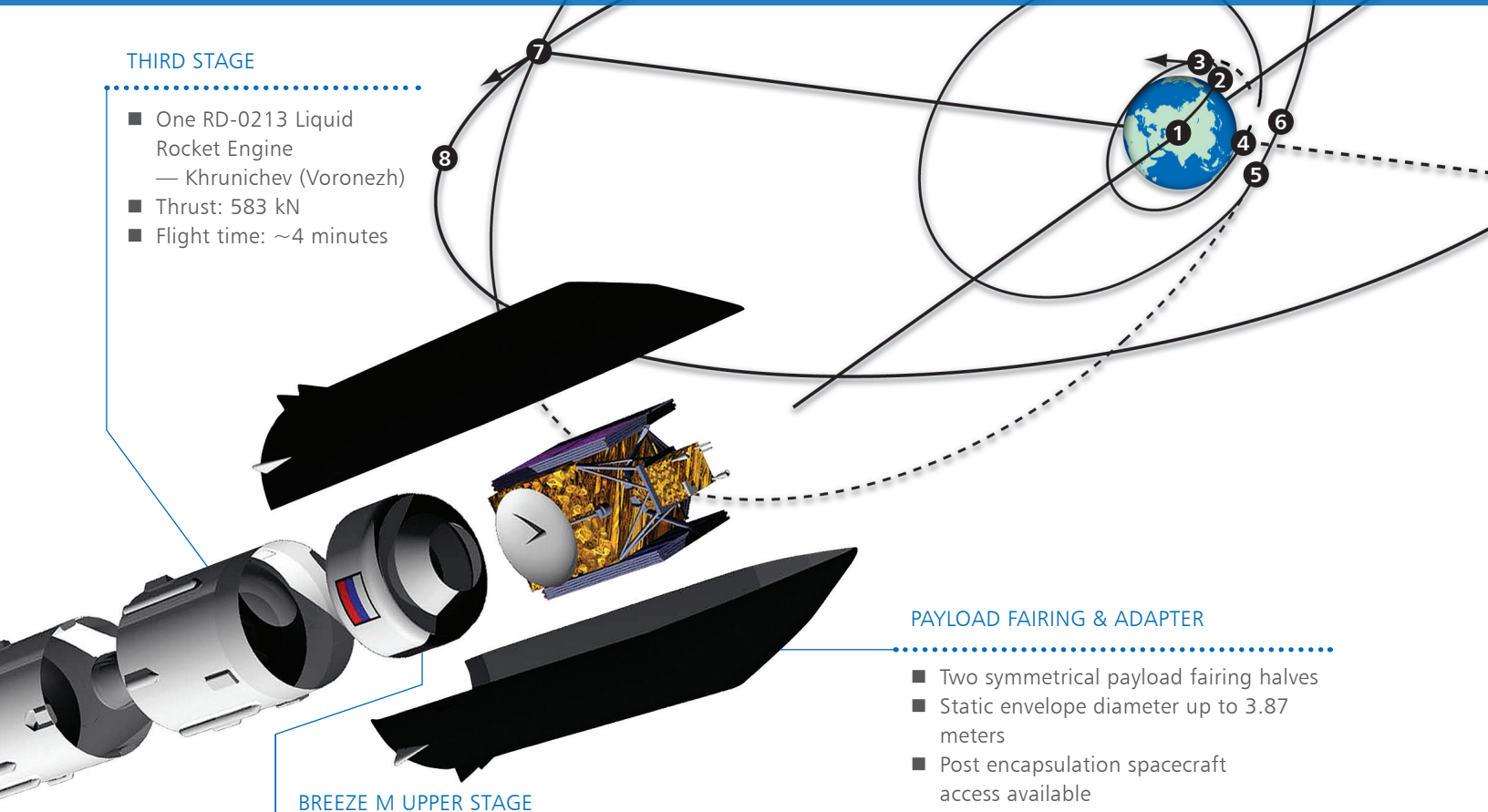


SECOND STAGE

- Three RD-0210 and one RD-0211 Liquid Rocket Engines — Khrunichev (Voronezh)
- Thrust: 2.4 MN
- Flight time: ~3.5 minutes

Typical Mission

1. LV Liftoff
2. Breeze M Separation from Proton LV
3. First Burn into Parking Orbit
4. Second Burn into Intermediate Orbit
5. Third Burn and APT Jettison
6. Fourth Burn into Transfer Orbit
7. Fifth Burn into Geosynchronous Transfer Orbit
8. Spacecraft Separation



THIRD STAGE

- One RD-0213 Liquid Rocket Engine
  — Khrunichev (Voronezh)
- Thrust: 583 kN
- Flight time: ~4 minutes

PAYLOAD FAIRING & ADAPTER

- Two symmetrical payload fairing halves
- Static envelope diameter up to 3.87 meters
- Post encapsulation spacecraft access available
- Composite sandwich monocoque structure
- Multiple adapter and separation system configurations available

BREEZE M UPPER STAGE

- Gimbaled 14D30 main engine
  — Khrunichev (Khimmash)
- Thrust: 20 kN

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Proton Production — Moscow

Proton launch vehicles and Breeze M Upper Stages are designed and built by Khrunichev State Research and Production Space Center (Khrunichev) in Moscow, the majority owner of International Launch Services (ILS). The Center is home to all engineering, assembly and test functions of the Proton production. And now, with the recent consolidation of the Russian space enterprises, Khrunichev has direct oversight and control of up to 70% of all Proton manufacturing from suppliers to manufacturers. The consolidation directly supports Khrunichev's ongoing efforts for vertical integration of Proton production and the future Angara launch vehicle.

KHRUNICHEV SPACE CENTER

- Proton first three stages and Breeze M
- Design, manufacturing, integration, testing
- Engineering and mission design
- More than 360 Protons delivered for launch

BAIKONUR COSMODROME

- Proton Breeze M launch operations
- Launch vehicle processing and integration
- All satellite launch preparations
- ISO Class 8 clean room facilities

Proton Launch Operations — Baikonur

The spacecraft is transported to the Baikonur Cosmodrome by air and is off-loaded at the on-site Yubileiny Airfield. It is then transported by rail to the state-of-the-art processing facility for testing, fueling, mating to the Breeze M upper stage and encapsulation within the payload fairing. Launch vehicle and spacecraft time on pad is five days.

Weather conditions in Baikonur make it an ideal location for Proton launches with very few constraints. Coupled with the two launch pads available for commercial missions, Baikonur offers unparalleled schedule assurance to customers.

Khrunichev is conducting modifications for a Second Spacecraft Processing Facility (SSPF) in Baikonur scheduled for completion in early 2011 to support ILS Proton missions. The SSPF provides additional manifest flexibility for customers by allowing overlapping launch campaigns, minimizing the required spacing between commercial launches and supporting timely launches on demand.

Quality

- Unified Quality Management System throughout Khrunichev and its integrated key suppliers
- Periodic reviews and recertification
- Quarterly Customer Quality Reports
- Insurance community annual briefings

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