



**Quality**

## Proton Production

Proton Launch Vehicles and Breeze M Upper Stages are designed and built by Khrunichev in Moscow. Khrunichev is home to all engineering, assembly and test functions of the Proton production.

### KHRUNICHEV SPACE CENTER

- Proton and Breeze M manufacturing
- Design, manufacturing, integration, testing
- Engineering and mission design
- More than 410 Protons launched
- Over 70 Proton M/Breeze M missions overall

### BAIKONUR COSMODROME

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



- Unified Quality Management System throughout Khrunichev and its integrated key suppliers
- Periodic reviews and recertification
- Quarterly Customer Quality Reports
- Insurance community annual briefings
- Commitment to continuous quality and reliability improvement

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## Proton Launch Operations

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 3 to 5 days.

Proton is designed to launch from Baikonur with very few weather restraints. Coupled with the two launch pads available for commercial missions, Baikonur offers optimal schedule assurance to customers.

ILS and Khrunichev provide manifest flexibility for customers by allowing overlapping launch campaigns, minimizing the required spacing between commercial missions to support timely launches.

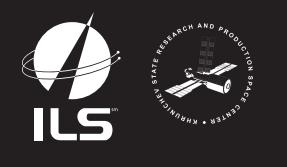
**EXPERIENCE ILS**  
**ACHIEVE**  
**YOUR MISSION**

**International Launch Services**  
FLEXIBILITY | PERFORMANCE | EXPERIENCE | DEDICATION



[www.ilslaunch.com](http://www.ilslaunch.com)

## Proton Breeze M



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FLEXIBILITY | PERFORMANCE | EXPERIENCE | DEDICATION

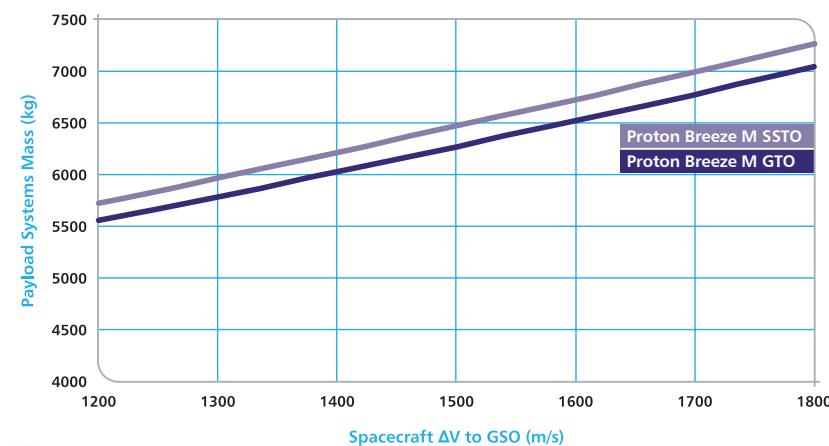
[www.ilslaunch.com](http://www.ilslaunch.com)

## Features

<b>HISTORY:</b>	MATERIALS:
More than 410 flights since 1965	Aluminum and composites
<b>PRODUCTION:</b>	<b>STRUCTURE TYPE:</b>
Capability to support up to 12 missions per year	Monocoque
<b>SUPPLIERS:</b>	<b>DIMENSIONS:</b>
Main components Russian-supplied	Length: 56.2 m or 58.2 m   Core diameter: ~4.1 m
<b>TYPICAL GTO MISSION:</b>	<b>GROSS MASS:</b>
~9 hours utilizing 5-burn Breeze M GTO mission design	~705 metric tons at liftoff
<b>STAGES:</b>	
<b>PROPELLANTS:</b>	
Nitrogen Tetroxide ( $N_2O_4$ ) Unsymmetrical DiMethyl Hydrazine (UDMH)	
<b>AVIONICS:</b>	
Closed-loop 3-string majority vote	

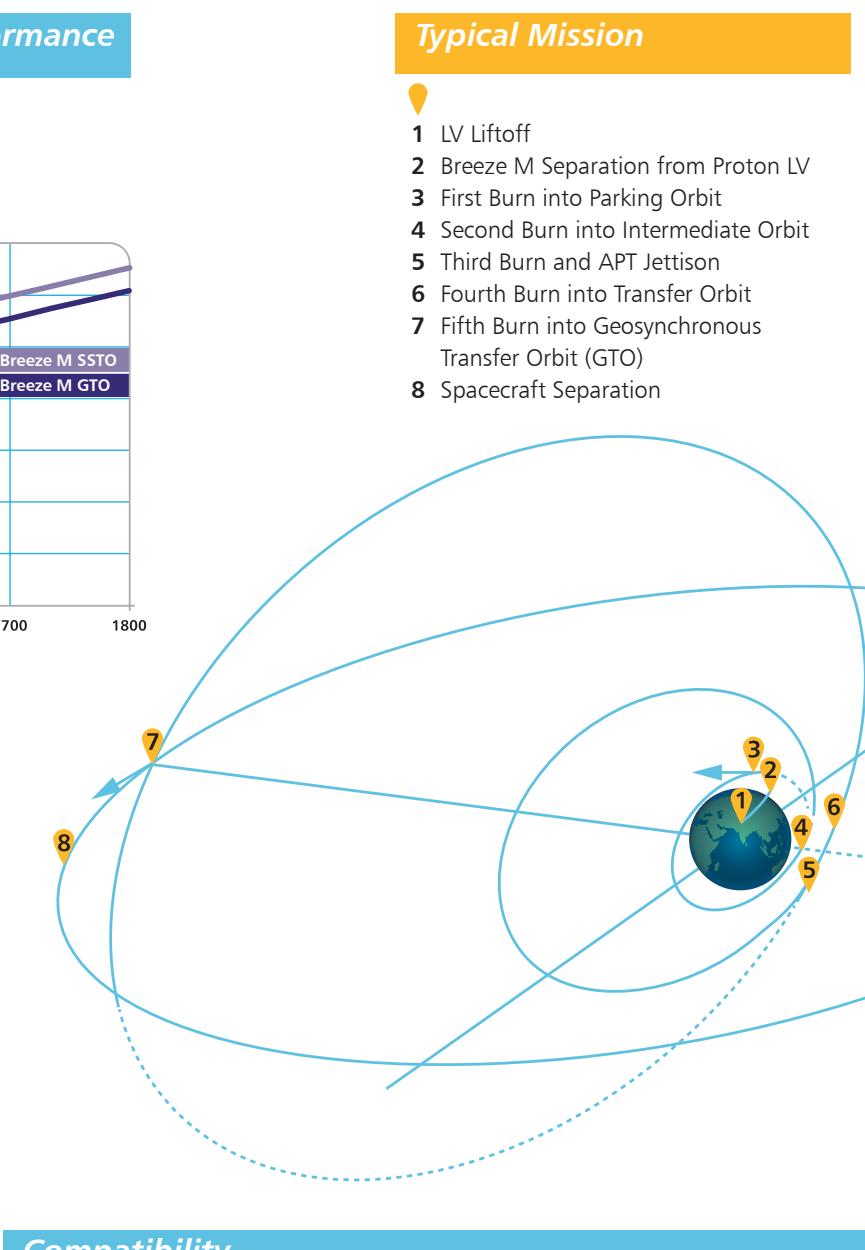
## Performance

### Payload Systems Mass vs $\Delta V$ to Geosynchronous Orbit (GSO)



#### PAYLOAD FAIRING & ADAPTER STAGE

- Two symmetrical payload fairing halves
- Static envelope diameter up to 3.87 m
- Post encapsulation spacecraft access available
- Composite sandwich monocoque structure
- Multiple adapter and separation system configurations available
- 13 m and 15 m PLF lengths available



## Compatibility

### Satellite Bus

	702	A2100	E2000/3000	SSL 1300	SB3000/4000	STAR	EXPRESS	DS2000
Compatible	•	•	•	•	•	•	•	•
Launched	•	•	•	•	•	•	•	•



With over 50 years of experience and over 410 flights, Proton is a proven, heritage launch system. International Launch Services (ILS) is a U.S.-based company with the exclusive rights to commercially market the Proton Breeze M, Proton Medium and the Angara 1.2 launch vehicles developed and built by Khrunichev State Research and Space Production Center (Khrunichev) of Moscow.

The **ILS Proton Breeze M** has the lift capability of 6.27 metric tons to reference GTO and 6.47 metric tons to reference SSTO at 1500 m/s  $\Delta V$ . In addition, ILS Proton's restartable Breeze M upper stage allows for optimizing each mission and maximizing projected in-orbit lifetime. ILS Proton can deliver single or multiple satellites into LEO, MEO, HEO, GTO, GSO and SSTO.

