

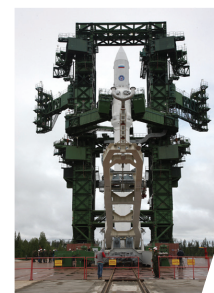
INTERNATIONAL LAUNCH SERVICES

ANGARA 1.2 FACT SHEET



Serving the Small to Medium Class Satellite Market (up to 3 Metric Tons to LEO)

- Higher performing, more cost effective launch solution in this payload class
- Flexibility to launch to various orbits



Angara Family of Launchers: With Proton, Addresses Entire Range of Spacecraft Masses

- The Angara family of launchers will support virtually all spacecraft to all orbits, altitudes and inclinations for the low-, medium- and heavy lift spacecraft
- High performing payload mass to lift-off mass ratio
- Success rate of 100% for all Angara flights
 - A variant of the Angara Universal Rocket Module (URM) system was flight demonstrated successfully as the first stage of KSLV (Korean Space Launch Vehicle) during its first three missions in 2009, 2010 and 2013
 - Angara 1 and 5 flight in 2014
- State of the art Angara factory in Omsk, Russia with all components domestically supplied

COMPANY

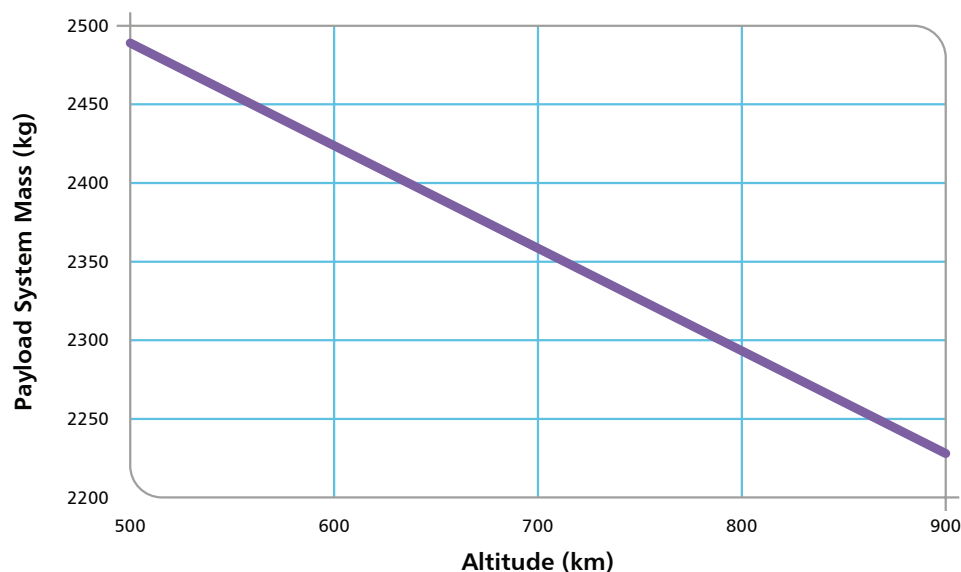
About International Launch Services (ILS), Khrunichev State Research and Space Production Center (Khrunichev) and Angara

ILS holds the rights to market the Angara vehicle to commercial customers. The Angara family of launchers will support virtually all spacecraft to all orbits, altitudes and inclinations for the small-, medium-, and heavy-lift spacecraft market. Based on state of the art technology, the Angara family of vehicles has a high performing payload mass to lift-off mass ratio. The Proton and Angara launch vehicles are manufactured by Khrunichev, the majority owner of ILS.

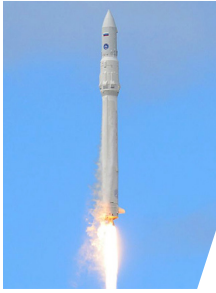
ILS announced the entrance of the Angara 1.2 vehicle into the commercial market in July 2015.

Launch Site: Plesetsk Cosmodrome, Northern Russia

Angara 1.2 Sun-Synchronous Performance from Plesetsk Cosmodrome

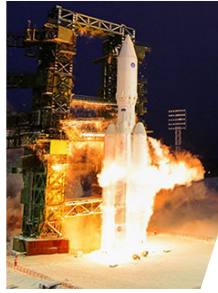


9 JULY 2014



1st Angara 1.2 Launch

23 DECEMBER 2014



1st Angara 5 Launch

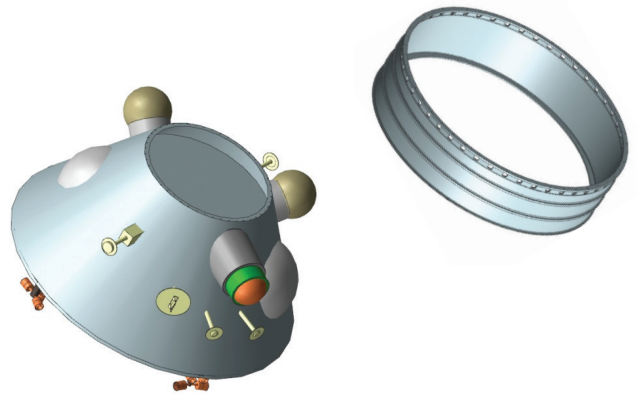
30 JANUARY 2013



KSLV Launched from Naro

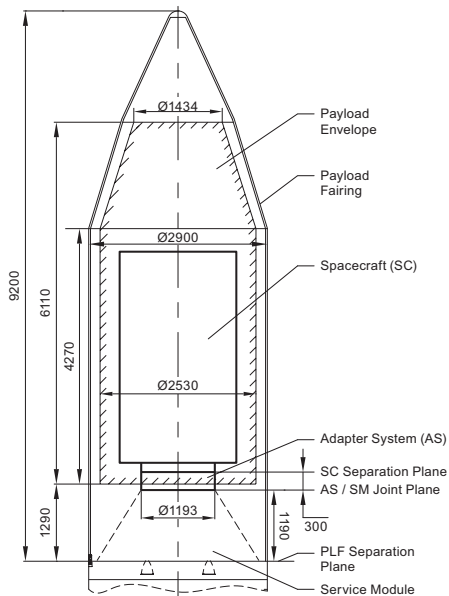
SERVICE MODULE

- The Service Module engine is designed to:
 - Generate velocity impulses to inject the spacecraft into its target orbit;
 - Support the required attitude during coast phase while on transfer orbit and for spacecraft separation; and
 - Generate velocity impulse for de-orbiting maneuver from the spacecraft target orbit.
- Uses 600 kg MON+MMH propellants



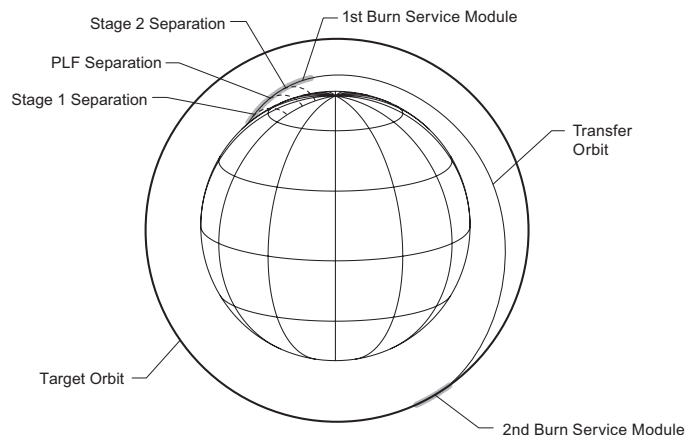
PAYLOAD FAIRING

- 2.9 m diameter PLF
- Clamshell design connected by mechanical pyro locks
- Installed on upper ring of Stage II
- PLF shell structure is 3-layered with honeycomb filling compound



ANGARA 1.2 LEO PERFORMANCE

Orbit Parameters		Payload System
H _{circ}	Inclination	Mass (kg)
200 km	63.2°	2960
835 km	98.7°	2270
1500 km	83°	1530



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