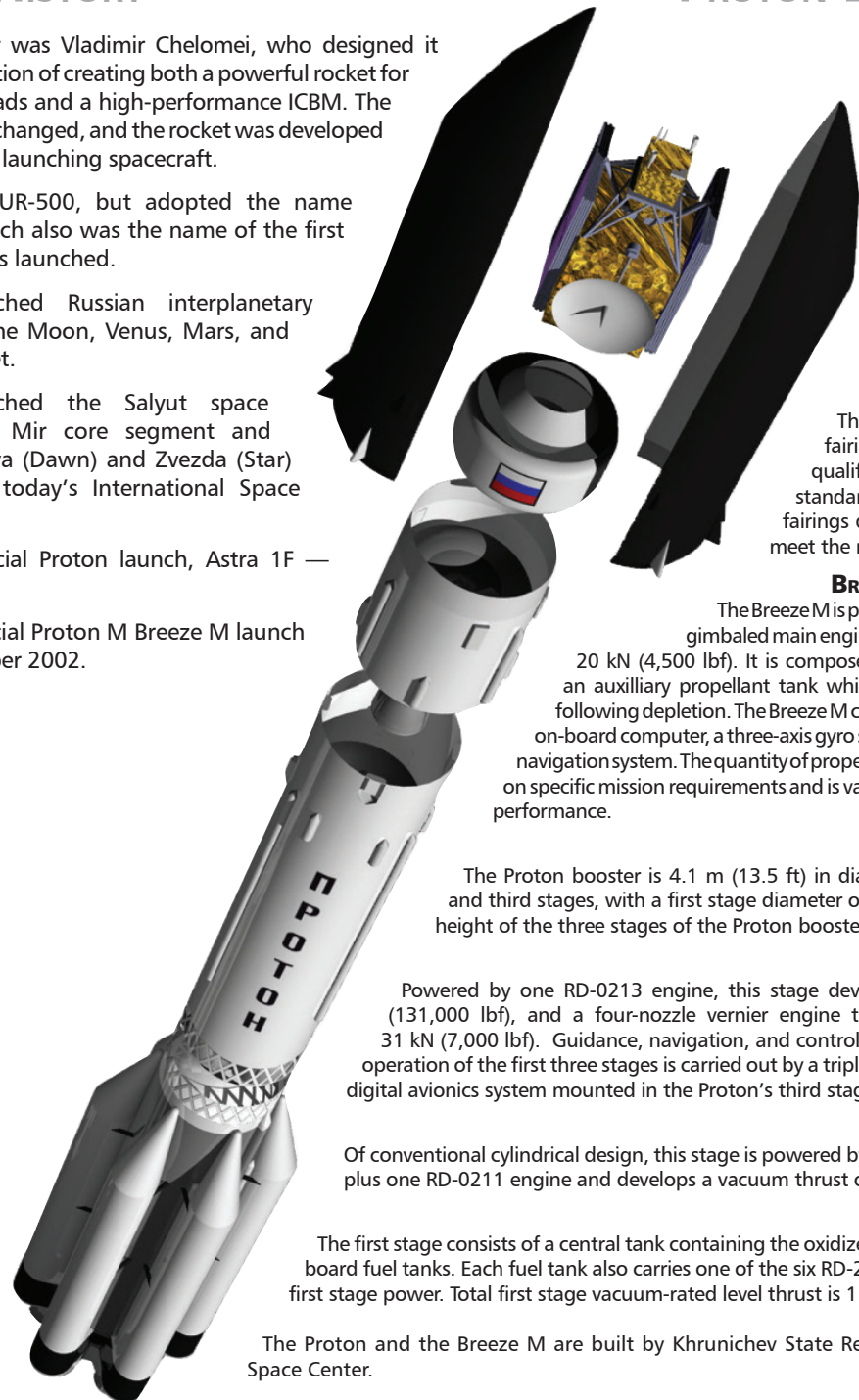


# THE VEHICLE

# THE SATELLITE

## PROTON HISTORY

- Lead designer was Vladimir Chelomei, who designed it with the intention of creating both a powerful rocket for military payloads and a high-performance ICBM. The program was changed, and the rocket was developed exclusively for launching spacecraft.
- First named UR-500, but adopted the name "Proton," which also was the name of the first three payloads launched.
- Proton launched Russian interplanetary missions to the Moon, Venus, Mars, and Halley's Comet.
- Proton launched the Salyut space stations, the Mir core segment and both the Zarya (Dawn) and Zvezda (Star) modules for today's International Space Station.
- First commercial Proton launch, Astra 1F — 9 April 1996.
- First commercial Proton M Breeze M launch — 30 December 2002.



## PROTON DESCRIPTION

**TOTAL HEIGHT**  
58.2 m (191 ft)

**GROSS LIFT-OFF WEIGHT**  
705,000 kg  
(1,554,000 lb)

**PROPELLANT**  
UDMH and NTO

**INITIAL LAUNCH**  
16 July 1965  
Proton-1 Spacecraft

**PAYLOAD FAIRINGS**  
There are multiple payload fairing designs presently qualified for flight, including standard commercial payload fairings developed specifically to meet the needs of our customers.

**BREEZE M UPPER STAGE**  
The Breeze M is powered by one pump-fed gimbaled main engine that develops thrust of 20 kN (4,500 lbf). It is composed of a central core and an auxiliary propellant tank which is jettisoned in flight following depletion. The Breeze M control system includes an on-board computer, a three-axis gyro stabilized platform, and a navigation system. The quantity of propellant carried is dependent on specific mission requirements and is varied to maximize mission performance.

**PROTON BOOSTER**  
The Proton booster is 4.1 m (13.5 ft) in diameter along its second and third stages, with a first stage diameter of 7.4 m (24.3 ft). Overall height of the three stages of the Proton booster is 42.3 m (138.8 ft).

**THIRD STAGE**  
Powered by one RD-0213 engine, this stage develops thrust of 583 kN (131,000 lbf), and a four-nozzle vernier engine that produces thrust of 31 kN (7,000 lbf). Guidance, navigation, and control of the Proton M during operation of the first three stages is carried out by a triple redundant closed-loop digital avionics system mounted in the Proton's third stage.

**SECOND STAGE**  
Of conventional cylindrical design, this stage is powered by three RD-0210 engines plus one RD-0211 engine and develops a vacuum thrust of 2.4 MN (540,000 lbf).

**FIRST STAGE**  
The first stage consists of a central tank containing the oxidizer surrounded by six out-board fuel tanks. Each fuel tank also carries one of the six RD-276 engines that provide first stage power. Total first stage vacuum-rated level thrust is 11.0 MN (2,500,000 lbf).

The Proton and the Breeze M are built by Khronichev State Research and Production Space Center.



**SATELLITE OPERATOR**  
TURKSAT  
[www.turksat.com.tr](http://www.turksat.com.tr)

**SATELLITE MANUFACTURER**  
MELCO  
[www.mitsubishielectric.com](http://www.mitsubishielectric.com)

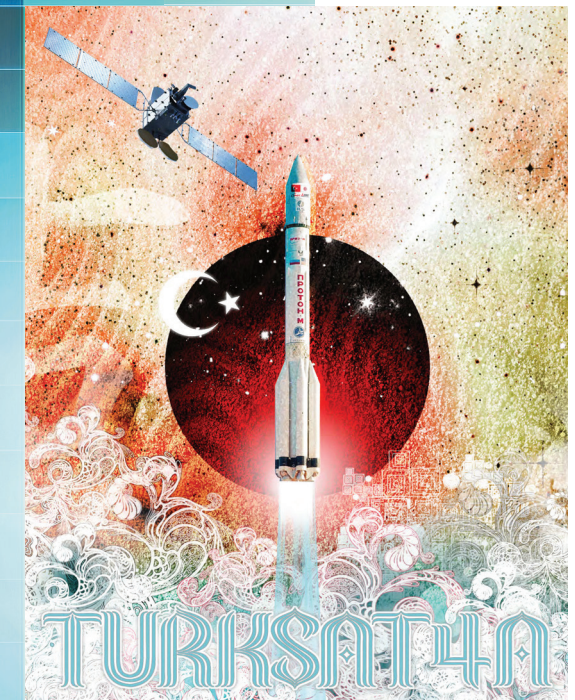
**PLATFORM**  
DS2000

**SEPARATED MASS**  
4850 kg

**SATELLITE MANEUVER LIFETIME**  
30 Years

### SATELLITE MISSION

TURKSAT-4A is a commercial communication satellite built by MELCO. The satellite will provide telecommunication and direct TV broadcasting services over a wide geographic region between west of China and east of England spanning Turkey, as well as Europe, Central Asia, the Middle East and Africa. TURKSAT-4A consists of several band transponders with expected on-orbit Maneuver Life of 30 years. TURKSAT-4A satellite will expand the space capacity of Turkey and provide enhanced performance to its coverage areas. The satellite will provide high flexibility of switchability and connectivity among different service areas to its customers.



## Mission Overview



**Experience ILS: Achieve Your Mission**  
QUALITY | PERFORMANCE | EXPERIENCE | DEDICATION

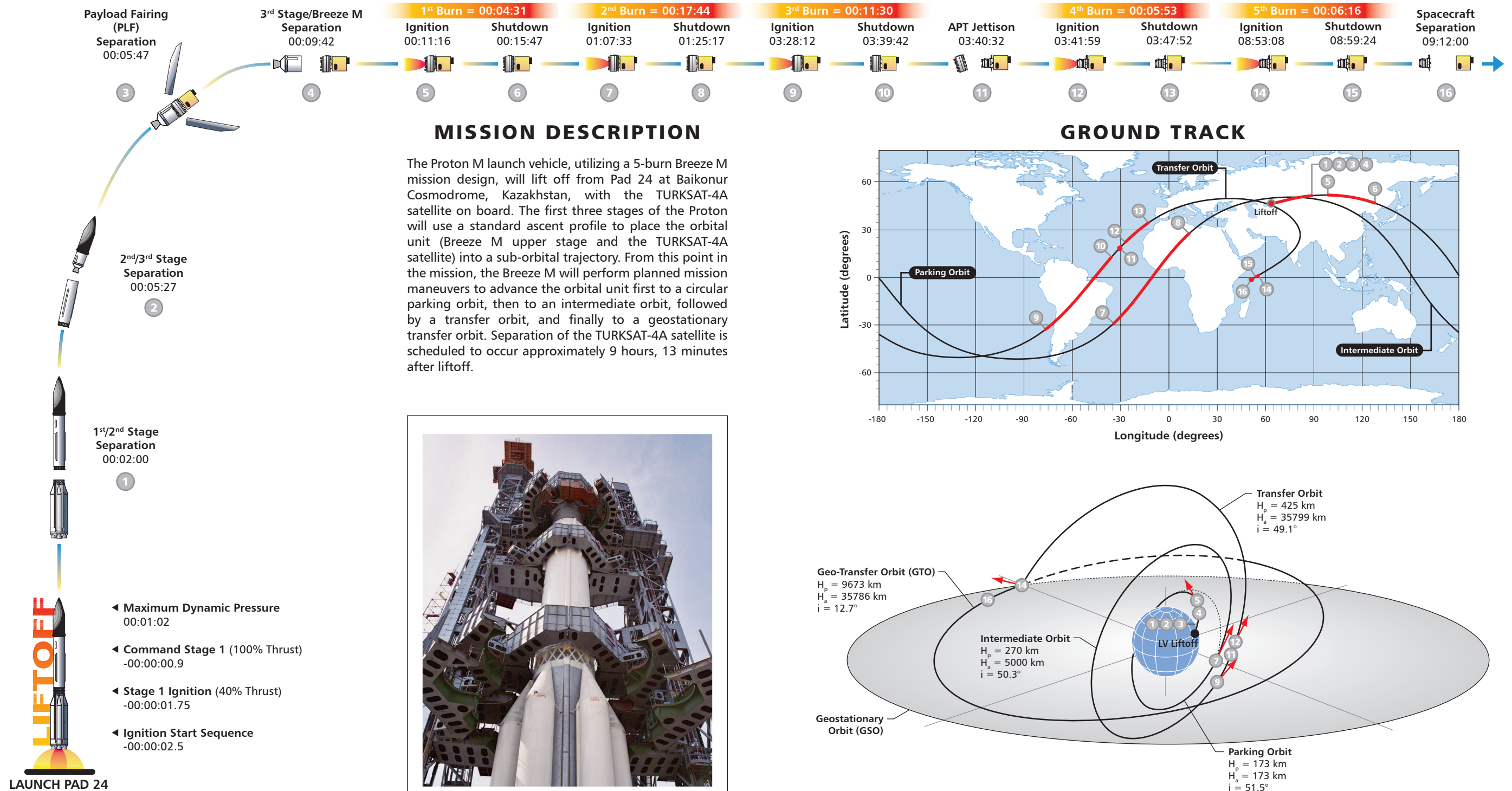


[www.ilslaunch.com](http://www.ilslaunch.com)

## TURKSAT-4A

- **1st** ILS Proton Launch in 2014
- **85th** ILS Proton Launch Overall
- **1st** TURKSAT Satellite Launched on ILS Proton
- **1st** MELCO Satellite Launched on ILS Proton

# THE MISSION



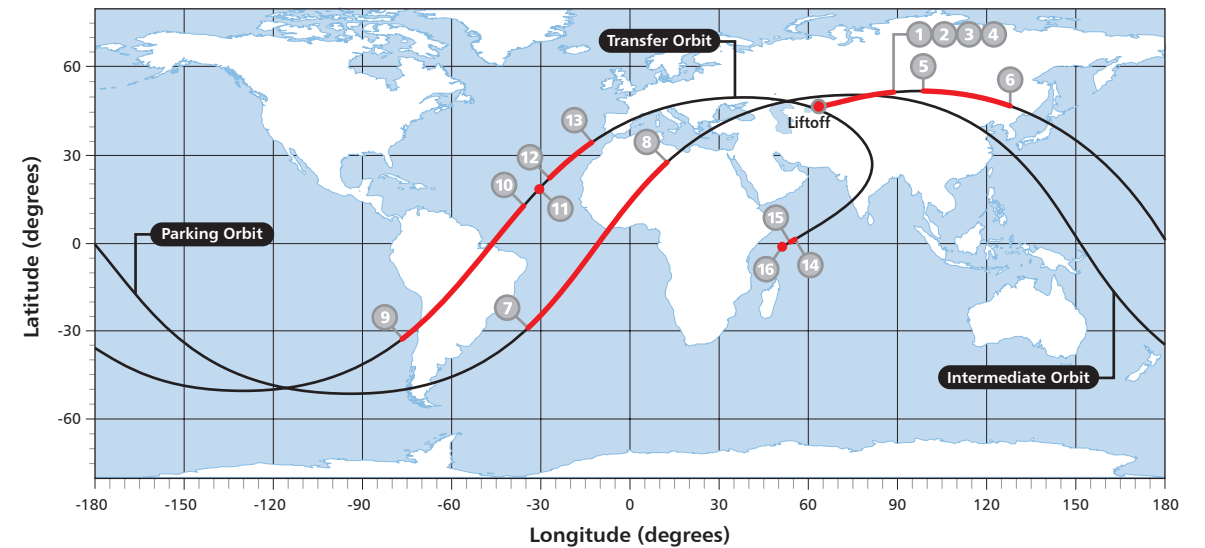
## MISSION DESCRIPTION

The Proton M launch vehicle, utilizing a 5-burn Breeze M mission design, will lift off from Pad 24 at Baikonur Cosmodrome, Kazakhstan, with the TURKSAT-4A satellite on board. The first three stages of the Proton will use a standard ascent profile to place the orbital unit (Breeze M upper stage and the TURKSAT-4A satellite) into a sub-orbital trajectory. From this point in the mission, the Breeze M will perform planned mission maneuvers to advance the orbital unit first to a circular parking orbit, then to an intermediate orbit, followed by a transfer orbit, and finally to a geostationary transfer orbit. Separation of the TURKSAT-4A satellite is scheduled to occur approximately 9 hours, 13 minutes after liftoff.

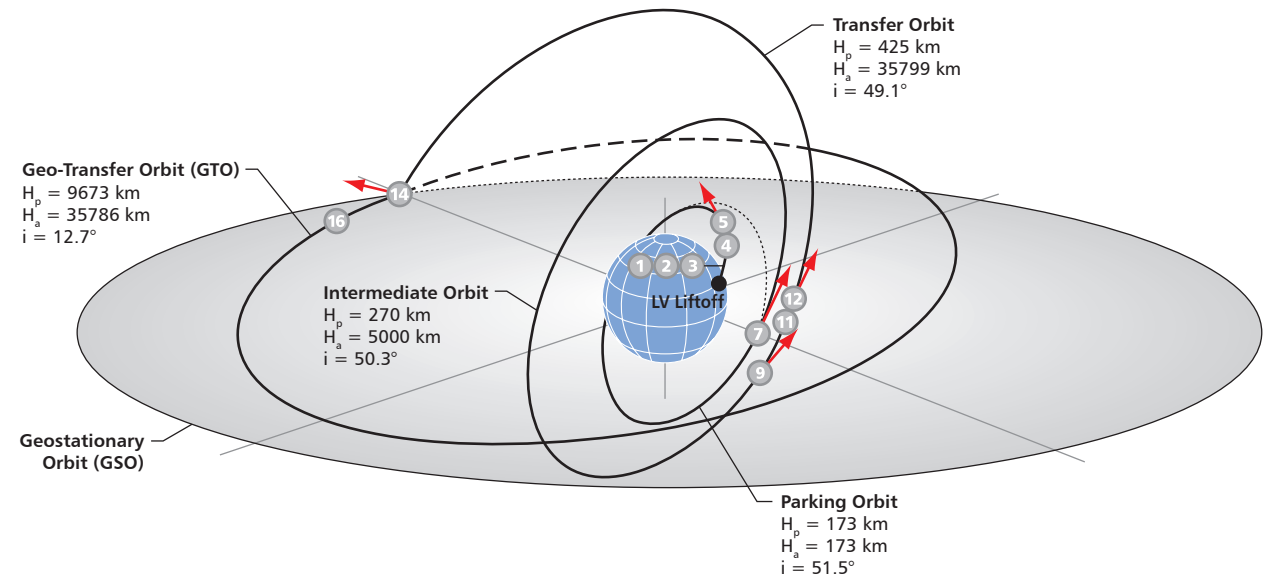


PROTON ON PAD 24

## GROUND TRACK



FLIGHT DESIGN



ASCENT PROFILE

- 1st/2nd Stage Separation  
00:02:00
  - 2nd/3rd Stage Separation  
00:05:27
  - 3rd Stage/Breeze M Separation  
00:09:42
  - Payload Fairing (PLF) Separation  
00:05:47
  - 1st Burn = 00:04:31
  - 2nd Burn = 00:17:44
  - 3rd Burn = 00:11:30
  - 4th Burn = 00:05:53
  - 5th Burn = 00:06:16
  - Spacecraft Separation  
09:12:00
- Maximum Dynamic Pressure  
00:01:02
  - Command Stage 1 (100% Thrust)  
-00:00:00.9
  - Stage 1 Ignition (40% Thrust)  
-00:00:01.75
  - Ignition Start Sequence  
-00:00:02.5

LAUNCH PAD 24