China's Lunar Exploration Program

Center for Lunar Exploration and Space Program of CNSA

February 2011

Objects and Significances of China's Lunar Exploration Program

Objects:

1. Embracing the lunar exploration technology;
2. Starting lunar scientific research and application study;
3. Involving in exploration, development and utilization of lunar resources for the future;

Significances:

Lunar exploration program is beneficial to boost the innovation and development of basic science, which will drive other high and new technologies to further leap. It will also make contribution to establish technological base for the development of deep space exploration.

General Plan for China's Lunar Program

China's Lunar Exploration Program mainly focus on robotic exploration, which includes three stages. Missions of circumlunar exploration, soft landing and roving, and sample returning.

Three stages are:

- "Circumlunar" 2002~2007 (First stage)
- "Landing" 2008~2014 (Second stage)
- "Return" 2015~2020 (Third stage)

China's Lunar Exploration Program-First stage

The First Stage has been fulfilled by 2007. Aims are Launching circumlunar satellite and making exploration.

Circumlunar

Main tasks:

- To develop and launch first lunar exploration satellite;
- To explore landform and terrain of lunar surface;
- To make comprehensive exploration on distribution and principles of lunar resources;
- To explore the environment between the earth and the moon.

China's Lunar Exploration Program-First stage

Circumlunar

Scientific Targets:

. Obtaining 3D images of lunar surface;

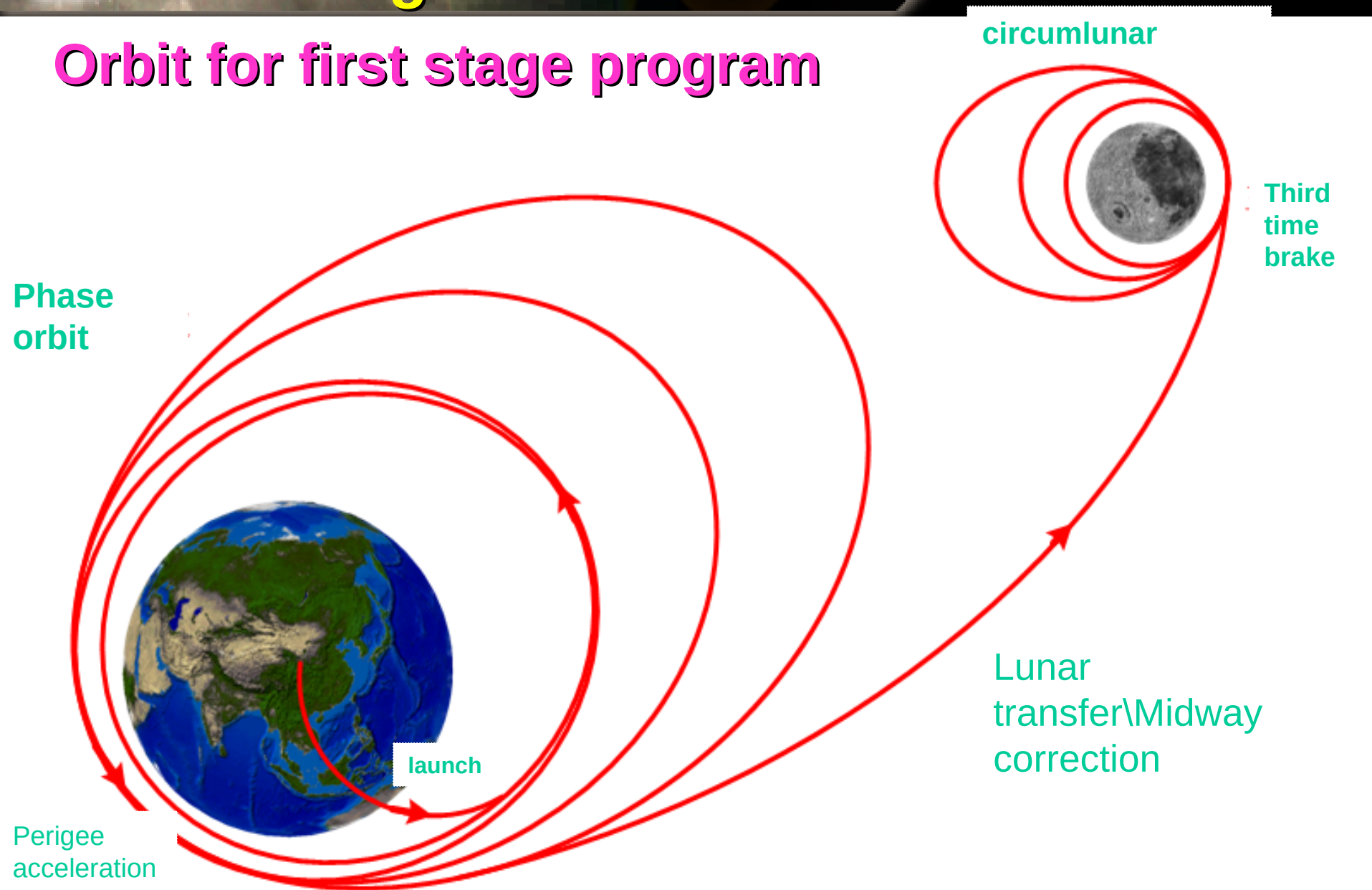
. Analyzing elements content and types of substances distribution on lunar surface;

. Exploring distinguishes of lunar soil;

. Exploring the environment from earth to moon.

China's Lunar Exploration Program-First stage

Orbit for first stage program



China's Lunar Exploration Program-First stage

Progression

Circumlunar

Jan, 23, 2010, Circum-lunar exploration program has been officially approved;

Oct. 24, 2007 18:05, Chang' e-1, China's first lunar exploration satellite, was launched in Xi-Chang Satellite Launch Center, and entered into preset orbit on time, which represents the longest journey China has ever made;

Nov. 5, 2007, Chang' e-1 succeed in its first perilune brake, then entering into circumlunar orbit;

Nov. 7, 2007, Chang' e-1 satellite entered into lunar circle orbit;

China's Lunar Exploration Program-First stage

Progression

Circumlunar

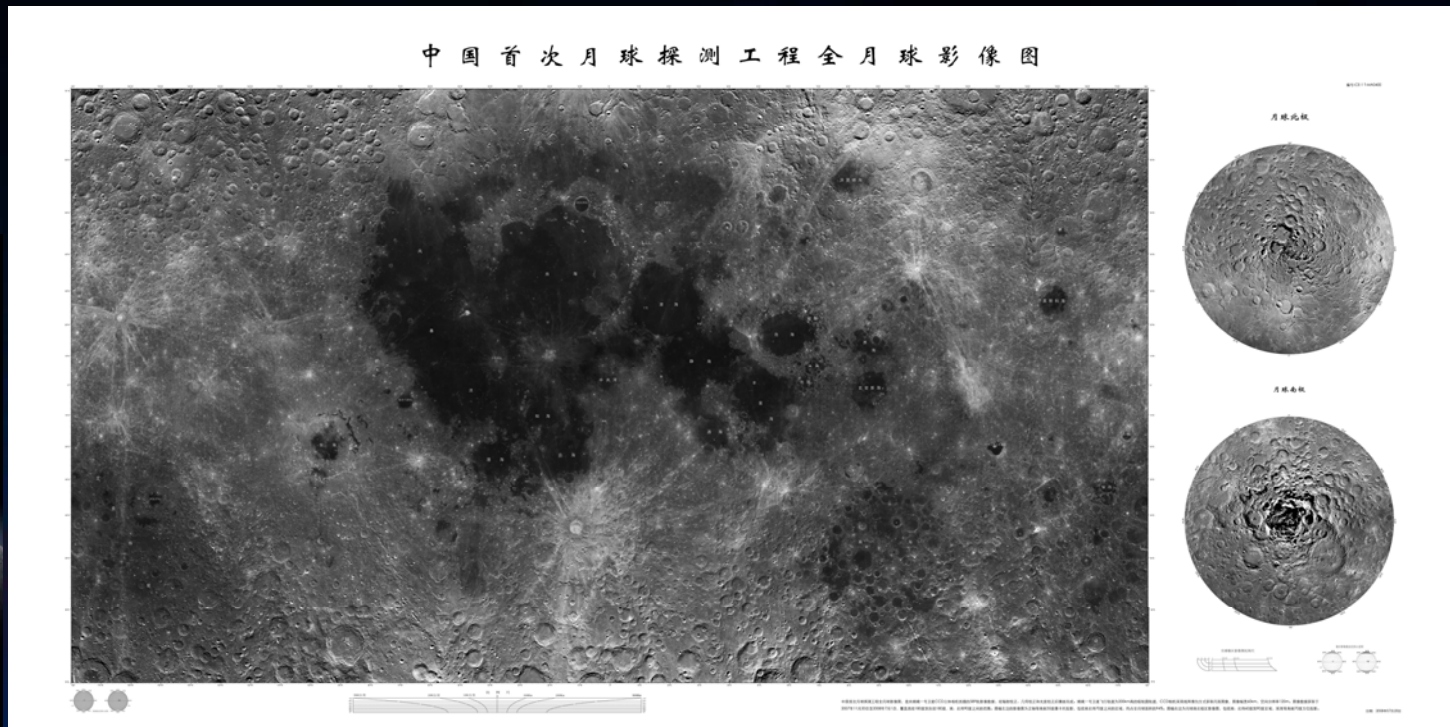
Nov.26, 2007, Publication of first lunar-image made by Chang' e-1 marked the success of China' s first Lunar Exploration Program;

Oct.24, 2008, Chang' e-1 satellite fulfilled its mission. During one year working, the satellite has passed 2 times of eclipses, 4 times of flying posture changes and 3 times of orbit maintenances. All payloads on satellite have made efficient exploration with over 1.37TB scientific data obtaining from the mission;

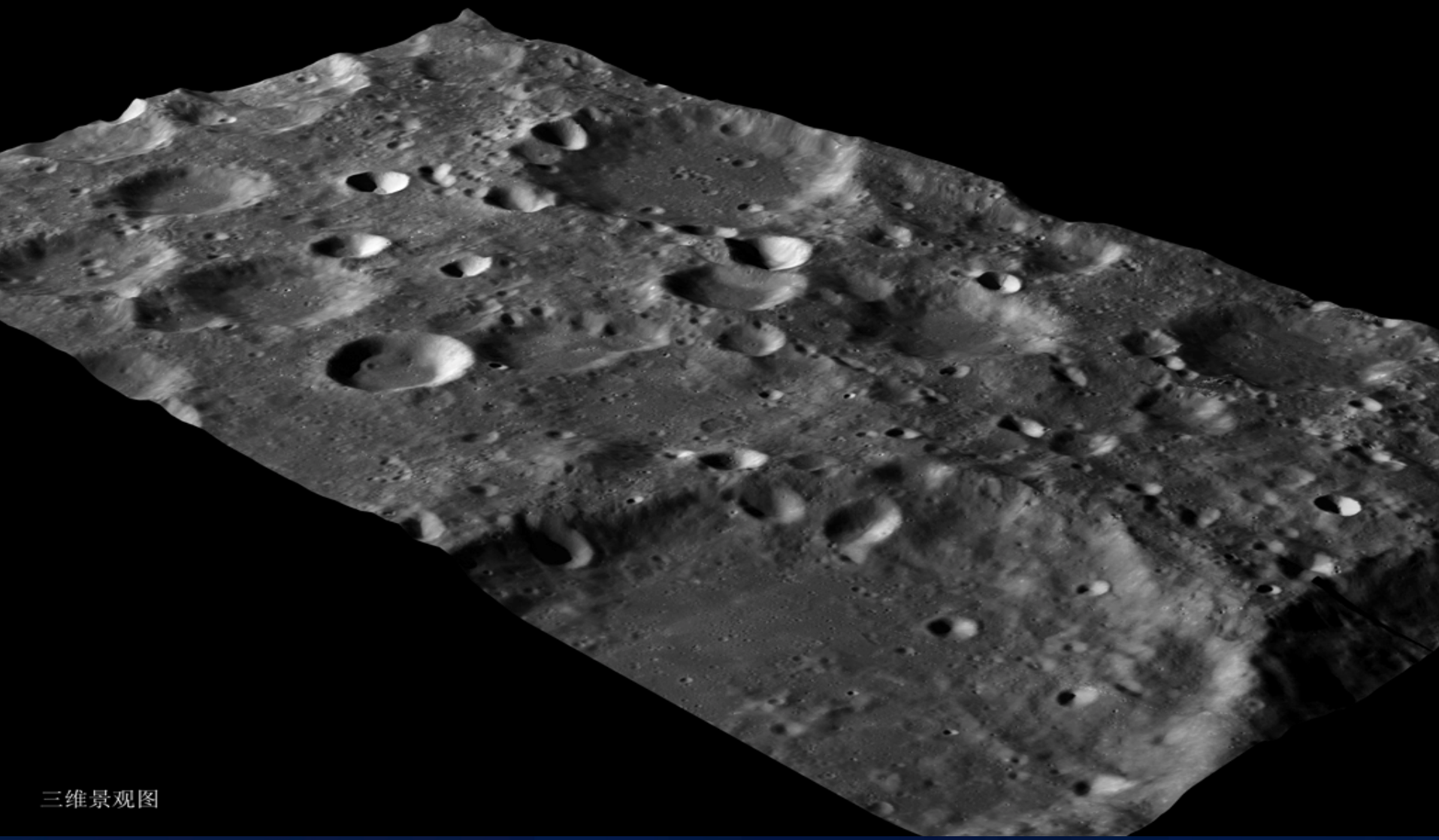
China's Lunar Exploration Program- First stage

Nov. 12， 2008, The first full lunar surface image has been published.

Circumlunar



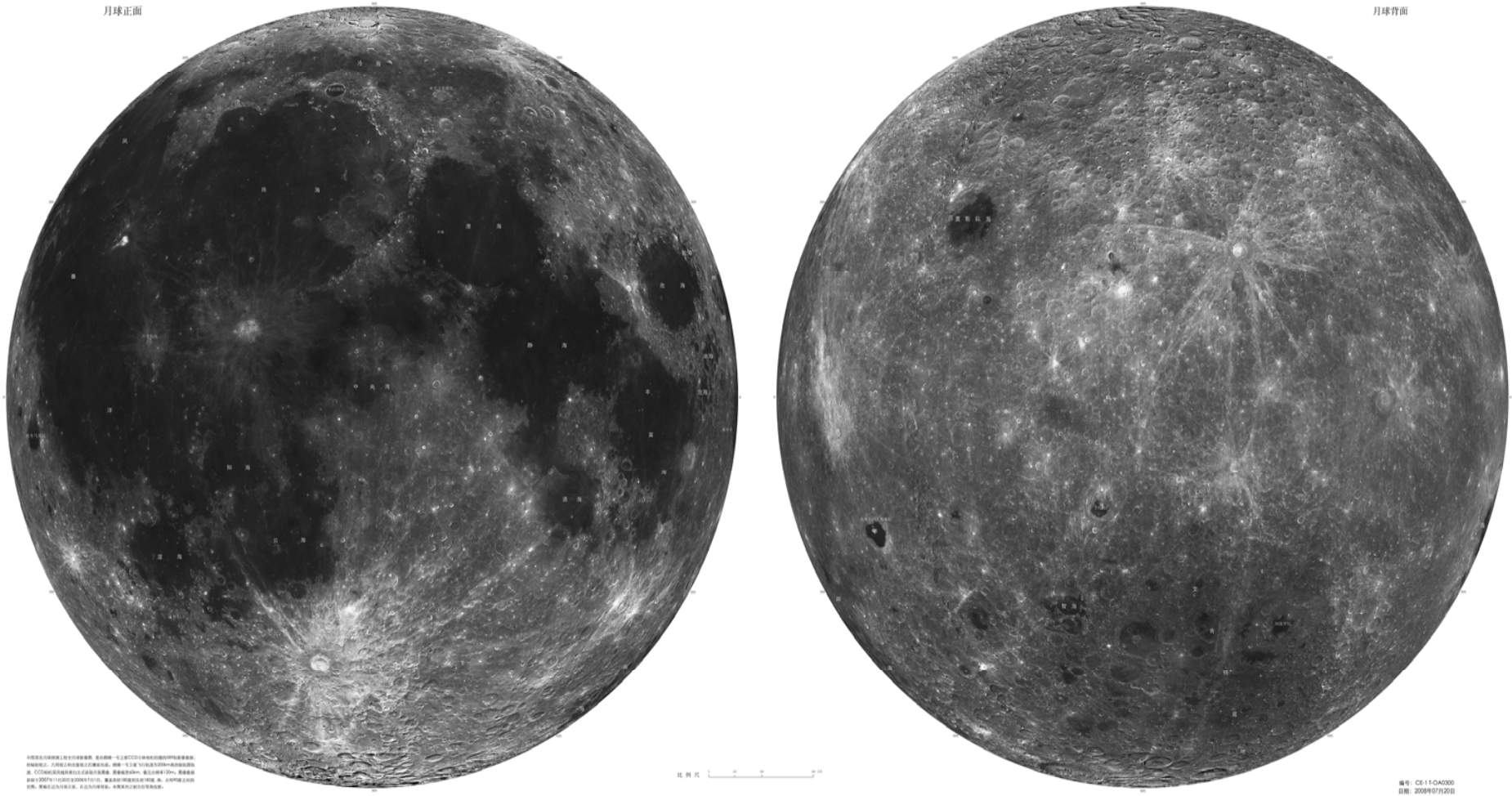
Scientific Results from Chang'e-1 Satellite



三维景观图

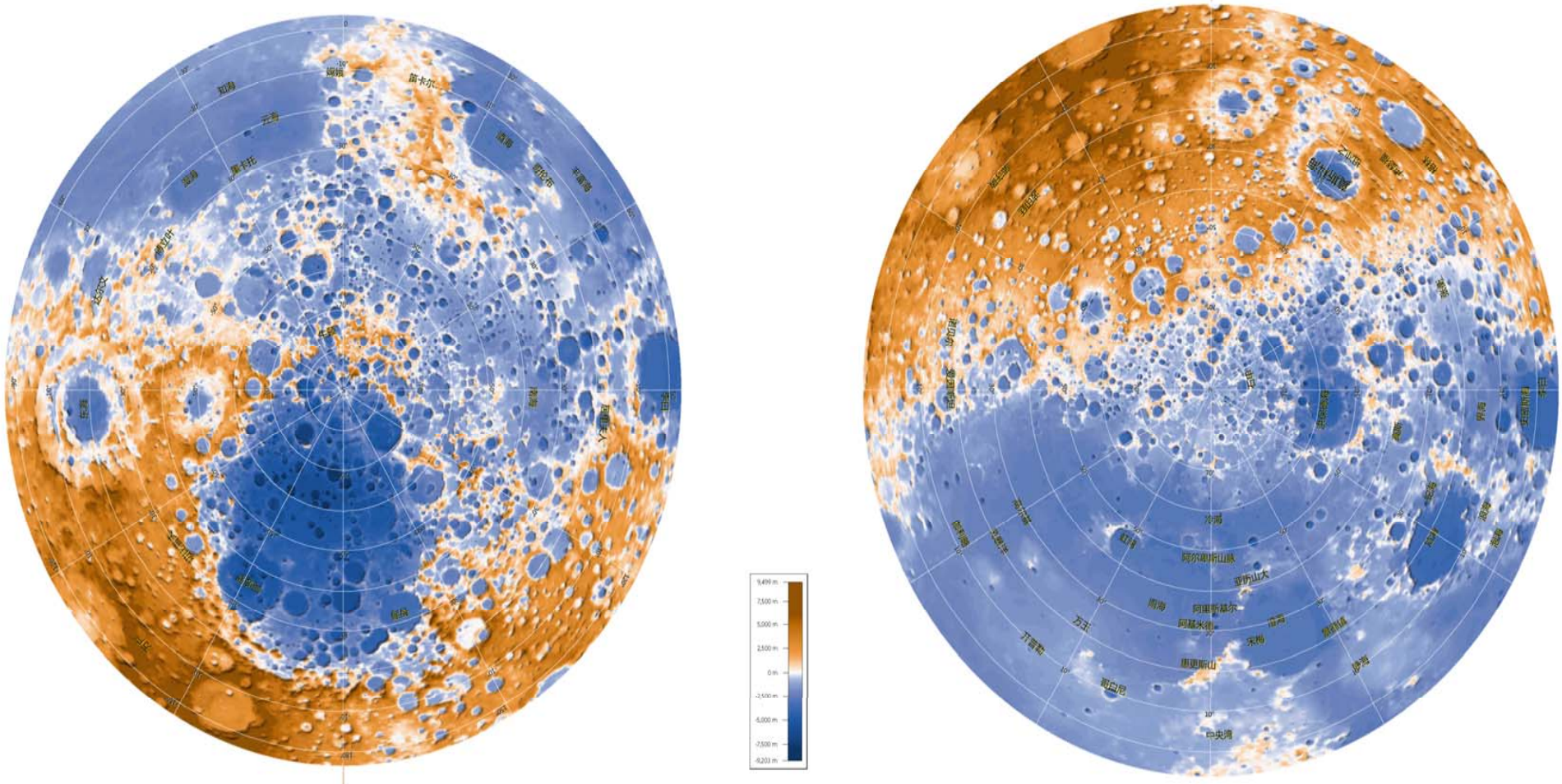
Scientific Results from Chang'e-1 Satellite

Full Lunar Surface Image Made by CCD Camera



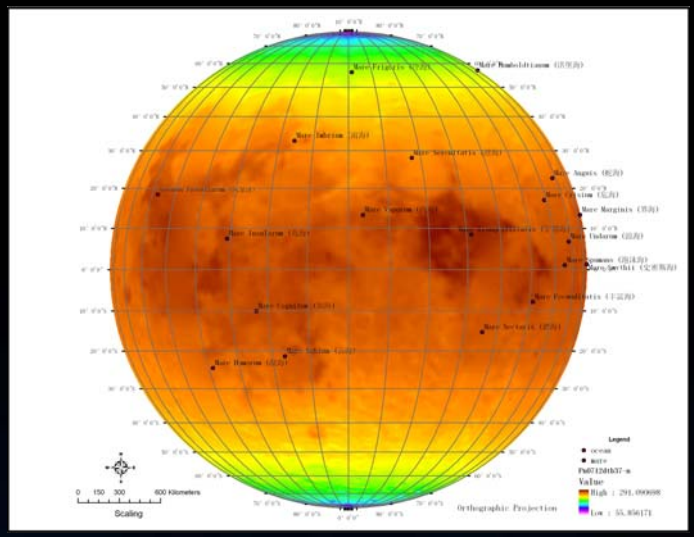
Scientific Results from Chang'e-1 Satellite

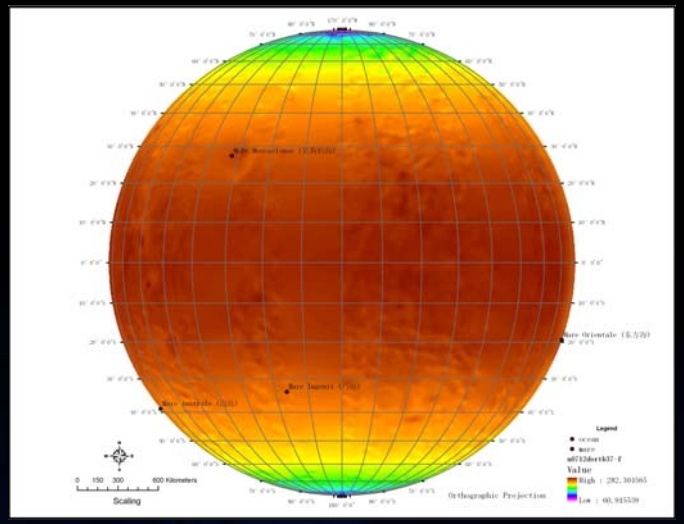
Full Lunar Surface Image Made by Laser Altimeter



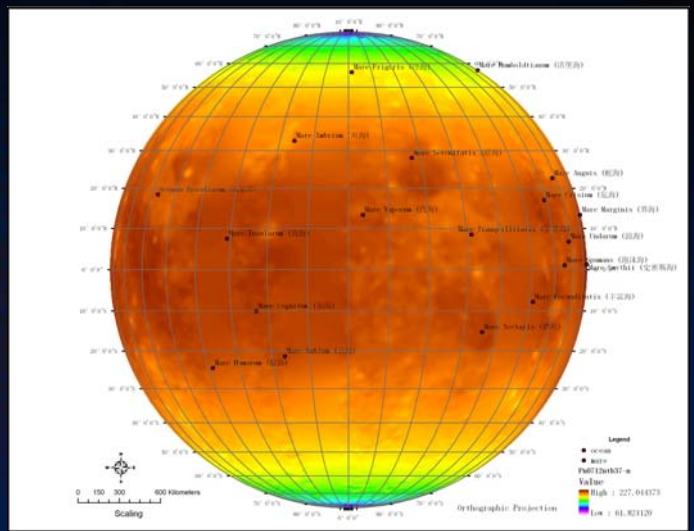
Scientific Results from Chang'e-1 Satellite

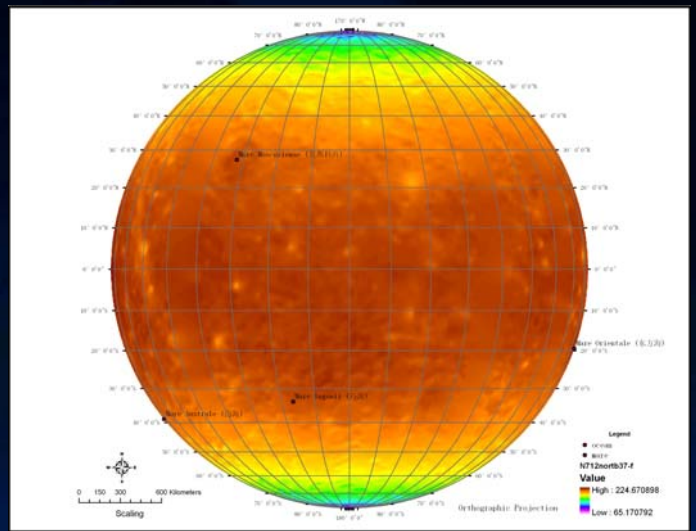
The micro-wave image of lunar in 37GHz





微波月亮 37GHz夜晚正面/背面





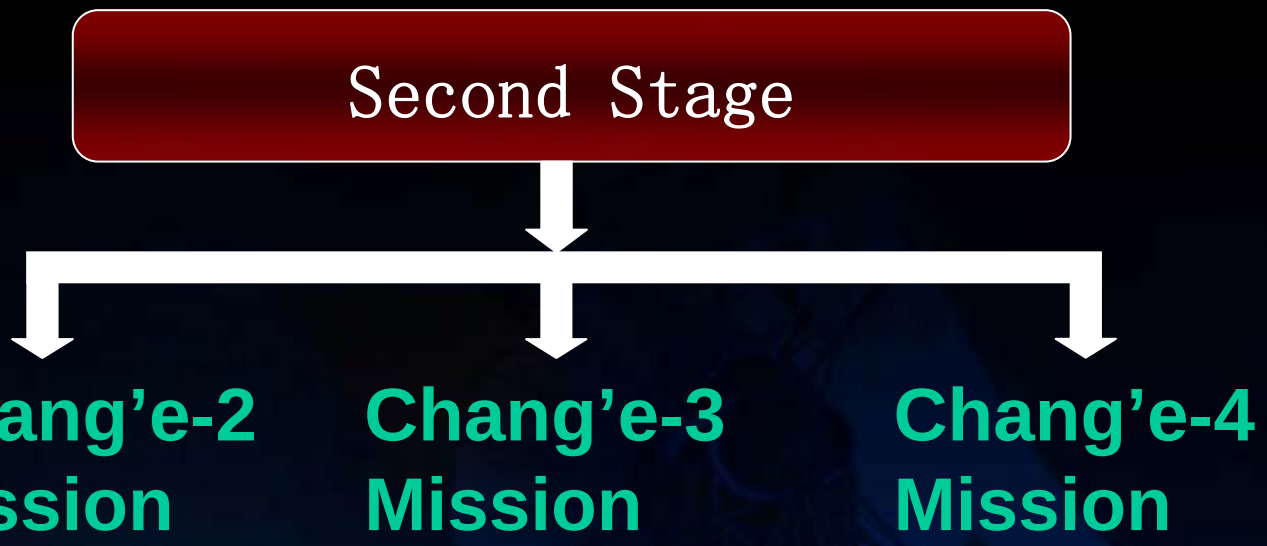
China's Lunar Exploration Program-First stage

After completing preset targets, Chang'e-1 satellite remained in good condition.

In order to give full play to its ability, After a series of orbit experiments, on Mar. 1st 2009, Chang'e-1 satellite has successfully crashed on the Mare Fecunditatis, the preset target area.

China's Lunar Exploration Program-Second stage

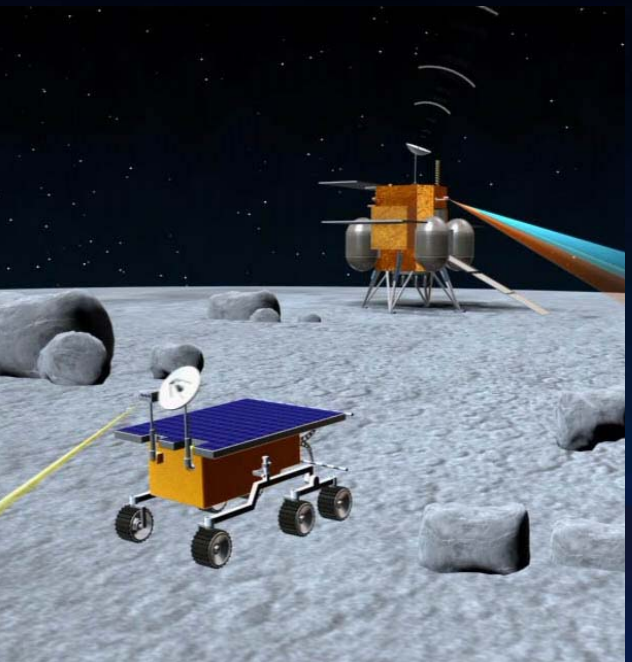
Missions as follows:



China's Lunar Exploration Program-Second stage

Chang'e-2 Mission

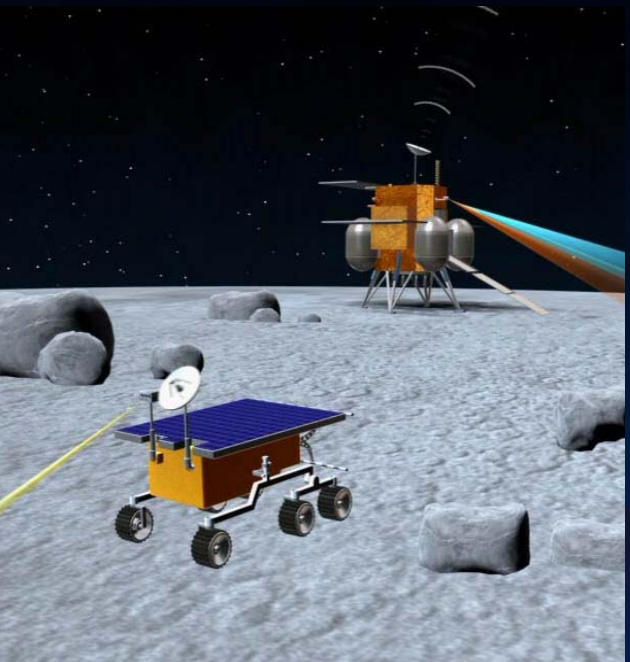
Landing



Based on the backup in circumlunar stage, Chang'e-2 satellite is taken as the technological test one. It's developed to verify parts of key technologies in second stage through technological improvement.

China's Lunar Exploration Program-Second stage

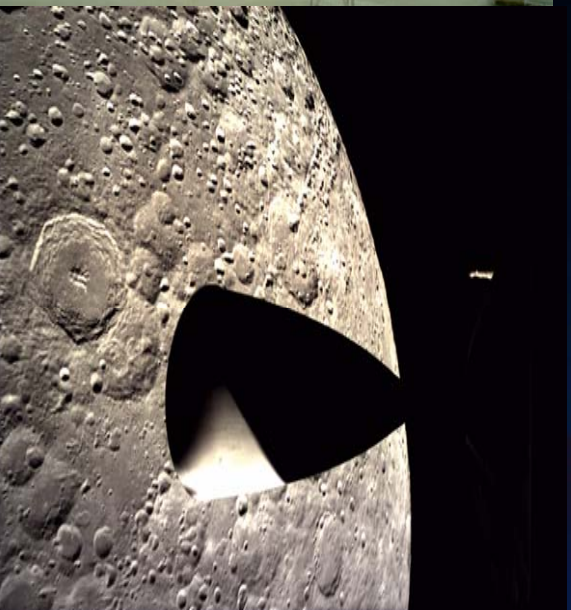
Landing



Based on technologies in CE-2 satellite:

1. To test LTO launching technology;
2. To test the circum-lunar technology at 100km orbit;
3. To test orbit maneuver technology for landing;
4. To develop high-resolution observation camera.

China's Lunar Exploration Program-Second stage



Progression of CE-2

Oct. 2008, Chang'e-2 mission was approved to implement.

Oct. 1st 2010, Chang'e-2 satellite was launched in XiChang launch Center, and entering into orbit precisely.

Oct. 2nd, 2010, Chang'e-2 finish its first mid-way correction.

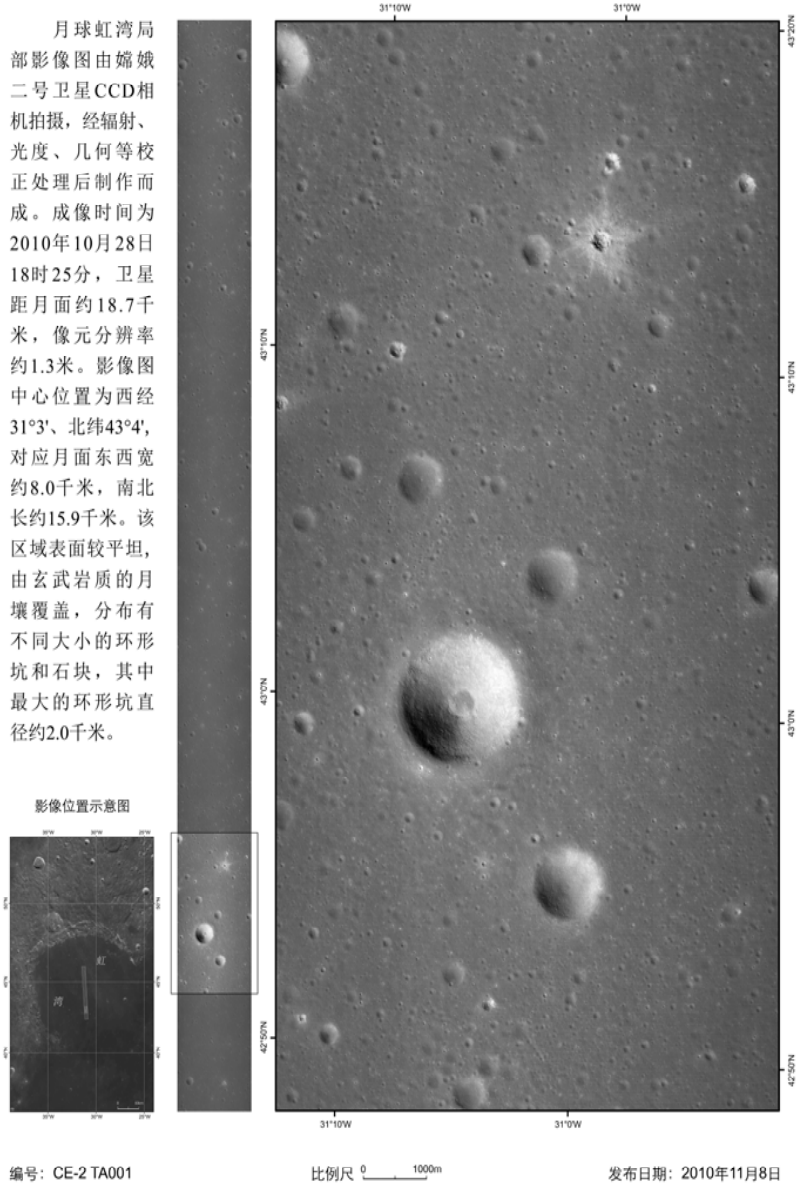
June. 2010, Chang'e-2 succeed in its first perilune brake.

China's Lunar Exploration Program-Second stage

On Oct. 27-29 2010,

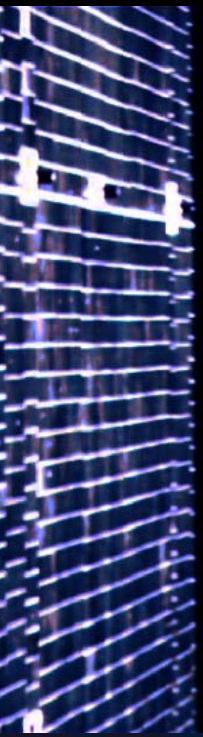
Chang'e-2 satellite made image of part of Sinus Iridum area.

Chang'e-2 mission successfully complete.

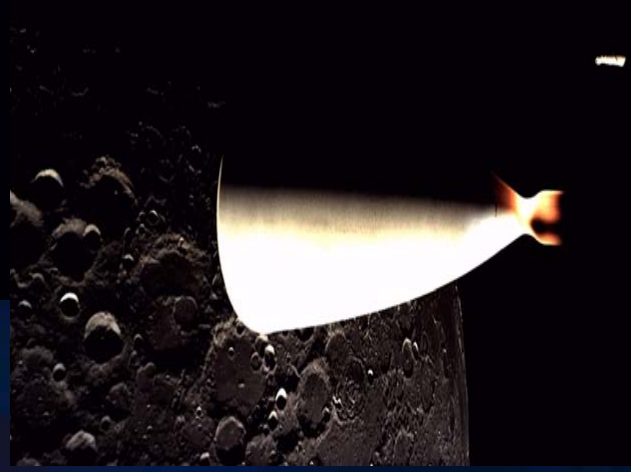


China's Lunar Exploration Program-Second stage

taking picture of developing the wings by camera on the satellite



taking picture of retrofire when the satellite on lunar orbit 100km far from lunar face



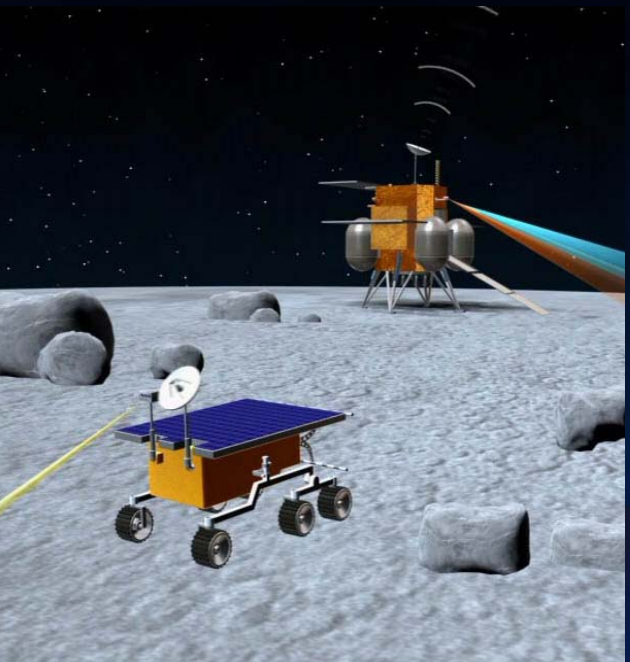
on Oct. 1st 2010, 19:59 taking picture of developing directional antenna

China's Lunar Exploration Program-Second stage

Chang'e-3 Mission：around 2013

Landing and Roving Exploration

Landing



Main Tasks：

- To launch lunar lander;
- To launch lunar rover;
- To make precise probe to landing site.

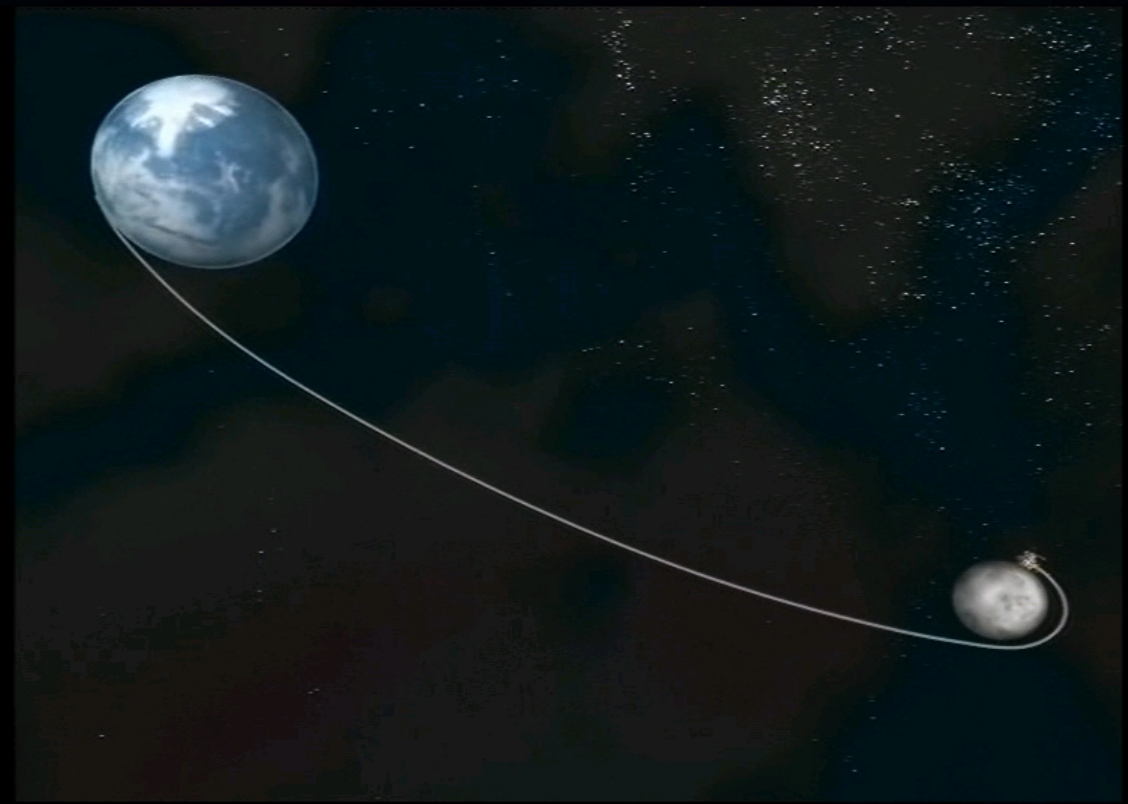
Life Time：

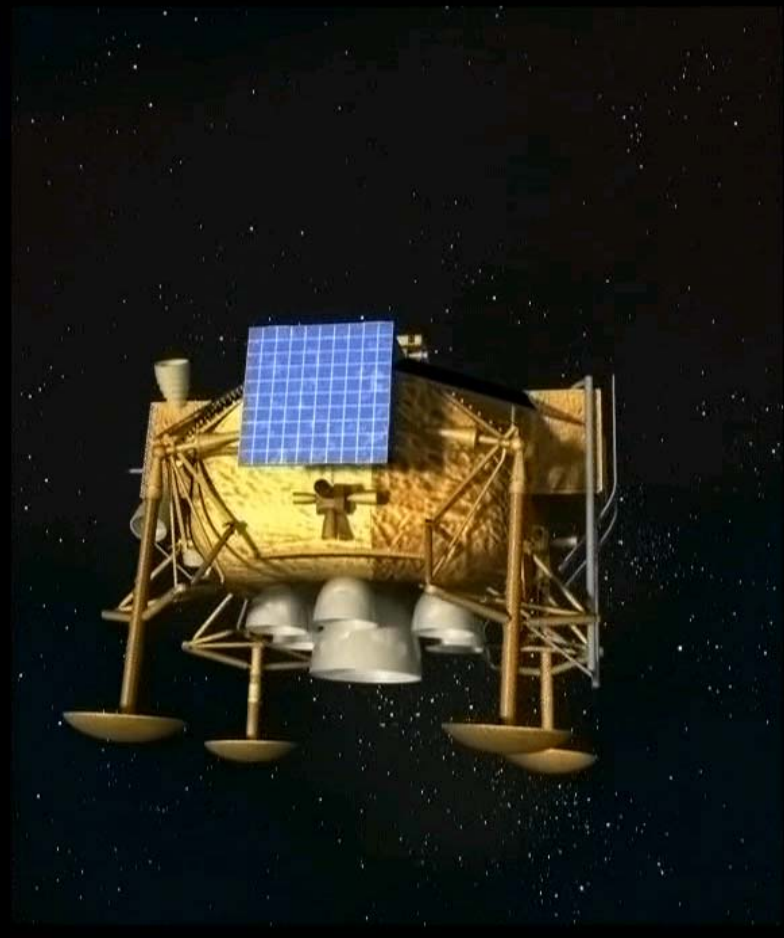
Lander will last 12 months, Rover will last 3 months.

Realization of landing and roving on lunar surface marks success of the program.

China's Lunar Exploration Program-Second stage

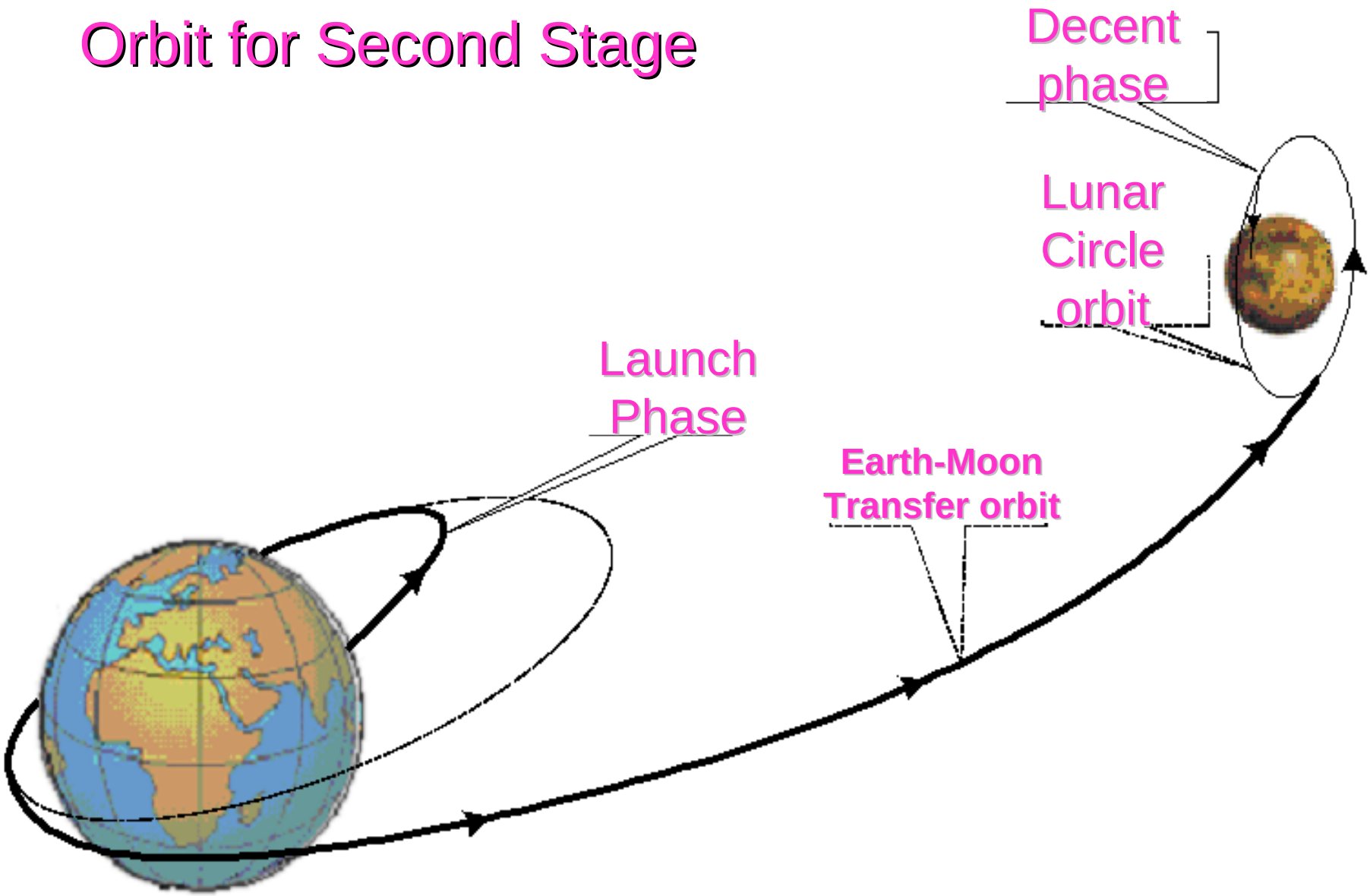
Chang'e-3 Mission：Satellite will be directly carried to earth-moon transfer orbit.





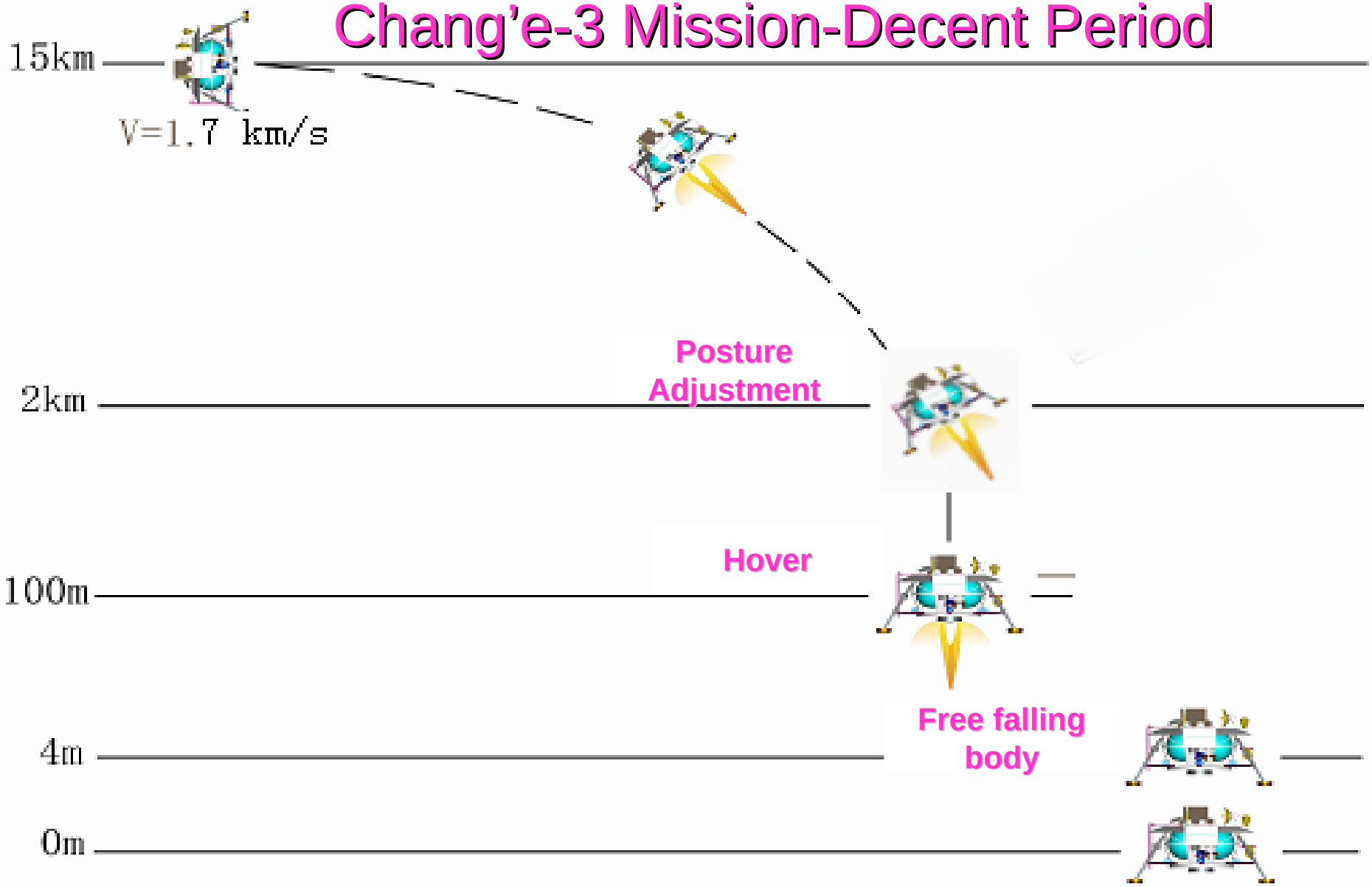
China's Lunar Exploration Program-Second stage

Orbit for Second Stage



China's Lunar Exploration Program-Second stage

Chang'e-3 Mission-Decent Period



China's Lunar Exploration Program-Second stage

Chang'e-3 Satellite

Implementation plan and some key technologies of Chang'e-3 mission has been tackled. Now the initial production is being developed.

China's Lunar Exploration Program-Second stage

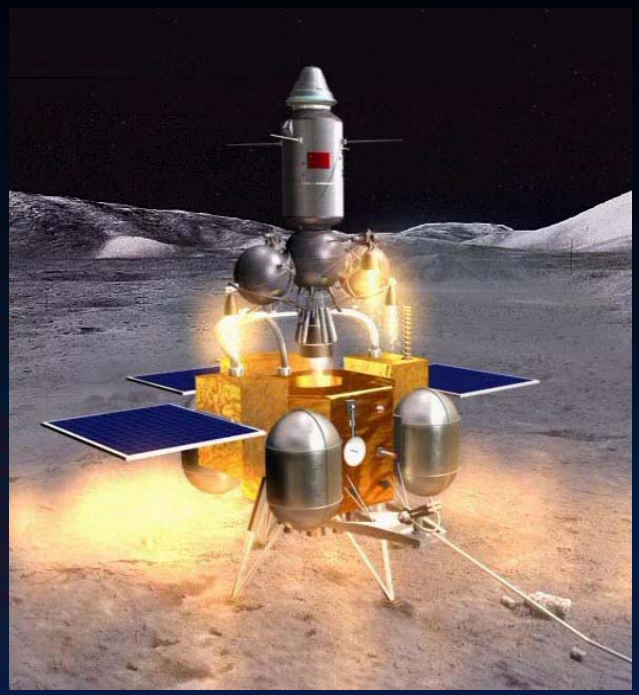
Chang'e-4 Mission

Chang'e-4 is the backup of Chang'e-3 mission

China's Lunar Exploration Program-Third stage

The third stage: around 2020

Returning



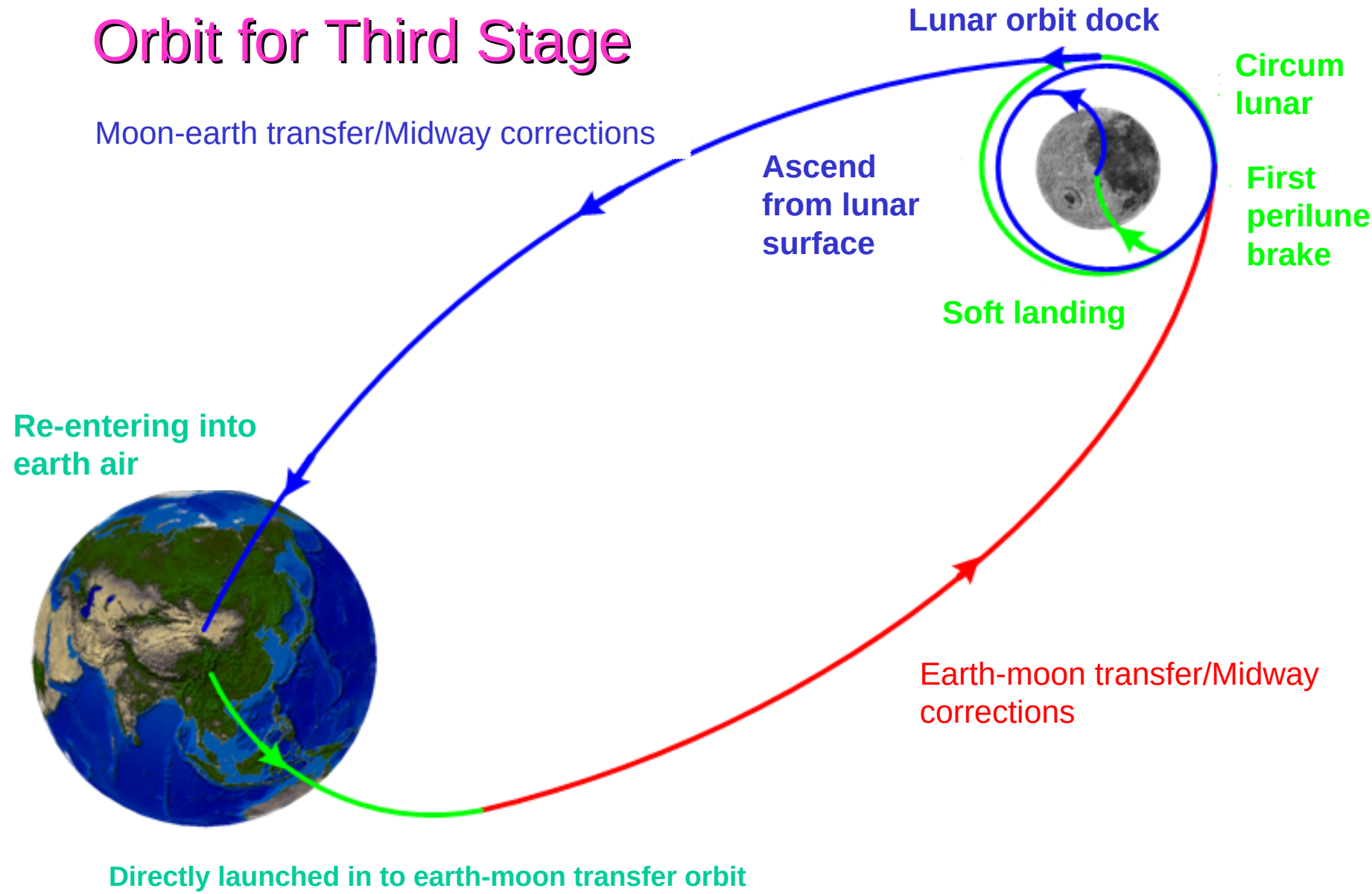
Sampling and Returning mission for the first time

Main tasks:

- Develop a small capsule for sampling and returning, a lunar surface drilling machine, a sampler, a robot arm etc.
- Sample and return to the earth based on the on-site analysis
- Investigate into the landing area
- Deepen the understanding of origin and evolution of the moon-earth system

China's Lunar Exploration Program-Third stage

Orbit for Third Stage



Thanks !