Federal Space Agency Future Missions

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Introductory Remarks

(1) Even after 30 years of the last Moon landing of Soviet Luna sample return mission, the memory of Moon Race is still fresh – public does not want another one. We need to suggest new motivations to Russian people for national lunar program.

(2) New philosophy of Moon exploration – self-consistent national program based both on the heritage of Soviet Lunas as well as on the new space technology, and in the content of international cooperation.

(3) There are three major directions of Moon exploration process in the national space program of Russia:

   (a) Human space flights (ISS operations, new space technology for human flights, ground simulations of space environment);

   (b) Robotic Lunar exploration missions;

   (c) Participation of robotic missions of other Agencies (i.e. LEND is contributed instrument for LRO).
Introductory Remarks (2)

(4) There are four major objectives of Russian Robotic Lunar Exploration Program:

(I) To make fundamental studies of the Moon (origin, evolution, internal structure, magnetic anomalies, etc.)

(II) To get the necessary science/engineering knowledge for supporting human missions to the Moon (visiting and permanent)

(III) To study the processes of lunar resources utilization

(IV) To create opportunities for astronomical, Sun and Earth observations
Introductory Remarks (3)

(5) There are three technical principles of the proposed Russian Robotic Lunar Exploration Program:

(I) To use *Sojuz-Fregat* launcher

(II) To use the *Phobos-Grunt (Phobos-Soil-Return)* mission, as the baseline prototype, for the first phases of the Program

(III) To combine the heritage of Soviet *Luna* landers and *Lunohods* with the development of new technology for surface elements of the Program
Comment about Phobos Soil Return mission:

There is a new spacecraft of the 4th generation for space science and interplanetary missions.

The goals are to study Mars (from orbit), Phobos (in situ) and to make Phobos soil return.

Launch is planned for 2009.
G. Polischuk, K. Pichkhadze, A. Luk’yanchikov, V. Dolgopolov et al.
FEDERAL SPACE AGENCY OF RUSSIAN FEDERATION
LAVOCHKIN ASSOCIATION

1-st phase:
Lunar internal structure exploration and lunar natural resources reconnaissance within the framework of orbital and landing missions

2-nd phase:
In-situ researches along the lunar rover movement route, samples collection and analysis

3-rd phase:
Lunar samples (collected by rover) return

4-th phase:
Creation on the Moon surface of a scientific-research base for development of principal methods for the Moon soil processing, delivery of the received samples and materials to the Earth and also for carrying out of a wide spectrum of scientific researches

ROBOTIC LUNAR EXPLORATION PROGRAM
Phase 1:

"LUNA-GLOB" PROJECT

Mission profile

ROBOTIC LUNAR EXPLORATION PROGRAM
Phase 1:

“LUNA-GLOB” PROJECT

Lander launch configuration

Lander landing configuration

Lander surface configuration

ROBOTIC LUNAR EXPLORATION PROGRAM
The Luna Glob mission:

The mission is in the approved program of Space Exploration of FSA, the launch is scheduled for 2009-2010

There are three segments of the mission:
- orbiter (polar circular orbit 100 km)
- polar lander
- penetrators (TBD)

Science instrumentation for Orbiter (>120 kg):
- surface remote sensing complex (gamma-rays, neutrons, visual, IR, radio)
- lunar space environment complex (plasma, particles, magnetic field)
- complex for fundamental astrophysics

Science instrumentation for Lander (> 5 kg):
- gamma-rays and neutrons
- panoramic view
- gas analyzer
- seismometer
Phase 2:

“LUNAR ROVER” PROJECT
Spacecraft landing configuration

ROBOTIC LUNAR EXPLORATION PROGRAM
Phase 3:

"LUNA-GRUNT" PROJECT
Mission profile

ROBOTIC LUNAR EXPLORATION PROGRAM
Phase 3:

“LUNA-GRUNT” PROJECT
Spacecraft landing configuration

ROBOTIC LUNAR EXPLORATION PROGRAM
Phase 4:

“LUNAR POLYGON” PROJECT

Base transport vehicles

Ascent/Return Rocket
Universal Mobile Lunar Platform
Right: Research Rovers
Technological Rovers

Lunar Scientific and Technological stations

Universal Orbital-Landing Platform

Lunar Service Modules

Injection Propulsion Module

ROBOTIC LUNAR EXPLORATION PROGRAM
Concluding Remarks

(1) The Russian Robotic Lunar Exploration Program is in the discussion stage now, but the very first mission “Luna Glob” of the phase 1 of this Program is already in the approved part of the FSA Space Program. Expected launch date is 2009-2010.

(2) Detailed concepts of the next missions for “Lunar Rover”, “Lunar Grunt” and “Lunar Polygon” will be determined when the first phase of the Program will be accomplished. The next decade is the time frame for these phases 2-4.

(3) However, three major cornerstones are quite well determined for the Program:
- medium-class launchers (Sojuz-Fregat) will be used,
- interplanetary vehicles with similar subsystems (Phobos-Soil-Return) will be used,
- new surface elements will be developed, based on the existing heritage of old time Lunas and Lunohods.