

National Aeronautics and Space Administration



Multinational Partnerships for Exploration

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www.nasa.gov

NASA's International Strategy



- Since the announcement of the U. S. Space Exploration Policy in 2004, NASA has pursued a multi-pronged approach in communicating NASA's program and opportunities for cooperation.
- Met commitments to assemble the International Space Station
- Sponsored workshops and conferences in the U. S., and have participated in conferences overseas.
- Initiated multilateral dialogue with representatives of 13 science and space agencies around the world under the banner of the Global Exploration Strategy.
- Employed specific bilateral strategies on a country by country basis based on a particular partner's capabilities and interest.

A Global Exploration Strategy



Human Civilization



Scientific Knowledge



Exploration Preparation



Global Partnerships

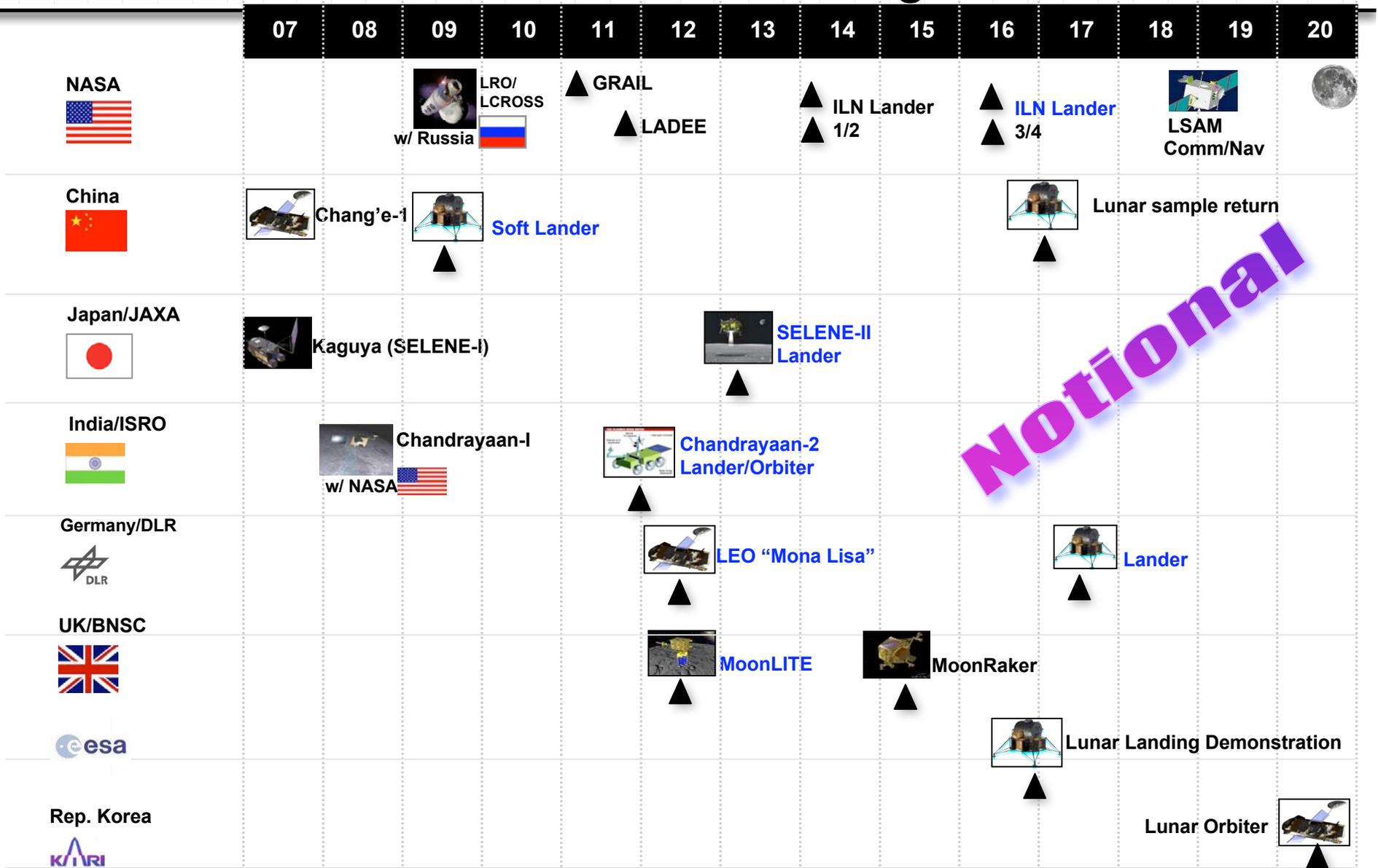


Economic Expansion



Public Engagement

The Road Ahead - International Lunar Orbiter and Landing Missions



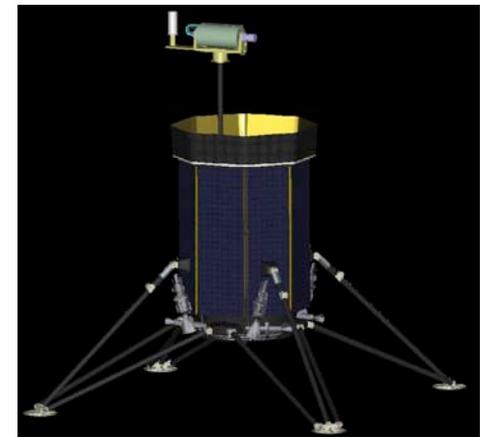
NOTIONAL

Blue Color – Denotes mission under review

International Lunar Network



- NASA is initiating an effort to coordinate future lunar landed missions into an International Lunar Network (ILN)
 - NASA provides two ILN nodes, launched in 2013/2014.
- The ILN is designed to emplace 6-8 stations on the lunar surface.
- Each ILN station would fly a core set of instrument types (e.g., seismic, laser retro-reflector, heat flow) requiring broad geographical distribution on the Moon.
- Each ILN station could also include additional instruments as desired by the sponsoring space agency.



ILN Micro-Lander

NASA Implementation Philosophy



- The US will build the transportation infrastructure and initial communication & navigation and initial surface mobility
- Open Architecture: NASA will welcome external development of lunar surface infrastructure



- The US will perform early demonstrations to encourage subsequent development
- External parallel development of NASA developed capabilities will be welcomed



Open Architecture: Infrastructure Open for Potential External Cooperation

US/NASA Developed Hardware - Establishing the Foundation for Lunar Exploration

- Launch Vehicle Architecture
- Lunar Lander: ascent vehicle, descent vehicle
- Initial EVA system for CEV and Initial Surface Suit
- Basic Navigation and Communication

Systems & Capabilities Envisioned for Outpost - Building on the Foundation

- Long duration surface suit
- Advanced, long-duration habitation
- Augmented power systems
- Basic, un-pressurized rover
- Pressurized rover
- Logistics rover
- Augmented, high-bandwidth satellite communication/navigation
- Logistics resupply
- ISRU production

Open for
Cooperation

Time

Robotic Precursor/Risk Reduction Missions that inform both system design and outpost operations

- LRO - Remote sensing and map development
- Flight system validation (Descent and landing)
- Rovers/Landers/additional orbiters for basic environmental data; materials identification & characterization
- ISRU characterization, demonstration

**US/NASA developed hardware

Status of International Collaboration

- **14 nations released “The Global Exploration Strategy: A Framework for Collaboration,” and established an International Space Exploration Coordination Group (ISECG) to facilitate cooperation.**
- **NASA is flying Moon Mineralogy and Mini-SAR instruments on the Indian Chandrayan-1 lunar orbiter.**
- **NASA and European Space Agency (ESA) completed comparative lunar exploration architecture assessment.**
 - **ESA is studying concepts for autonomous lunar cargo landing systems, communications and navigation systems, and lunar habitats.**
- **NASA and British National Space Centre (BNSC) have agreed to jointly study concepts for the UK MoonLITE mission to deploy a network of seismometers on the lunar surface.**
- **Nine countries have signed a statement of intent to continue discussions for an International Lunar Network program.**
- **NASA and CSA have participated in joint field tests of robotic and EVA systems at Devon Island, Canada and Moses Lake, Washington.**
- ★ **Canadian and German space agencies are planning to participate in field test of in-situ resource utilization systems at Mauna Kea, Hawaii in November.**

