

Human Spaceflight Plans of Russia, China and India

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by

Marcia S. Smith

Space and Technology Policy Group, LLC

Russia

- Extensive experience in human spaceflight
 - First animal in space (1957), first man in space (1961), first woman in space (1963), first spacewalk (1965), first space station (1971)
 - Seven successful space stations (Salyut 1, 3, 4, 5, 6, 7 and Mir) before partnering in International Space Station (ISS)
 - No people beyond low Earth orbit (LEO), however
 - For earth orbit, continues to rely on Soyuz, first launched in 1967, but upgraded many times and is key to ISS operations
 - Designed space shuttle, Buran, but launched only once in automated mode (no crew) in 1988

Russia (2)

- Existing reliable launch vehicles
 - Proton is largest: 21 tons to LEO; 5.5 tons to geostationary transfer orbit (GTO)
- Attempts to build Saturn V-equivalent in 1960s and 1970s failed (N1 failed four times in four attempts 1969-1972)
- Energiya booster in 1980s only flew twice (1987 with Polyus and 1988 with Buran). Abandoned for financial reasons.
 - Was 100 tons to LEO; 18-20 tons to GTO; 32 tons to lunar trajectory.
 - RD-170 engines for Energiya's strap-ons live on today in other forms for Zenit, Atlas V, and Angara (under development)

Russia (3)

- Robotic planetary space exploration mixed
 - Excellent success at –
 - Moon (Luna and Lunokhod series, plus Zond circumlunar flights)
 - Venus (Venera series)
 - Halley's Comet (Vega 1 and 2—also Venus)
 - Jinxed at Mars
 - More than a dozen failures in 1960s - 1970s
 - Partial success with Phobos 2 in 1988 (Phobos 1 failed)
 - Mars 96 failed to leave Earth orbit
 - Phobos-Grunt scheduled for later this year; designed as sample return from Phobos (includes Chinese orbiter)

Russia (4)

- Grand statements over decades about sending people to the Moon and Mars, but never enough money to proceed.
- Space advocates in Russia undoubtedly want a human Moon/Mars mission like their American counterparts, but it is unlikely that Russia will devote the financial resources needed for such a mission in the foreseeable future.
- Any country (or entity) interested in beyond LEO human missions could benefit from partnering with Russia considering its extensive experience with long duration human spaceflight (up to 14 months for one cosmonaut).

China

- The focus of much attention in the United States especially by those who want to foster a new “space race”
- Many western reports about China’s goal of sending people to the Moon confuse China’s plans for robotic versus human missions
- China takes a measured approach to human spaceflight.
 - First human spaceflight in 2003 after several test flights; second in 2005, third in 2008 (first spacewalk, for 26 minutes)
 - Next related launch is later this year, but is of two robotic spacecraft

China (2)

- Careful step-wise approach
 - Next step is rendezvous and docking between robotic 8.5 ton Tiangong-1 and an unoccupied Shenzhou 8 in second half of 2011. Crewed Shenzhou 9 and 10 expected to dock with it next year.
 - Various officials say next step is space laboratory “before 2016” with cargo spacecraft capability and three-person crew.
 - New stories say a 60-ton space station composed of three 20-ton modules by 2020. (ISS is over 400 tons.)
 - CONCEPTUAL studies of a human lunar landing

China (3)

- China is building a new “large” launch vehicle, Long March 5, and a new launch site at Hainan Island, but it’s not enough for a human lunar landing
 - 25 tons to LEO, equivalent to Delta IV Heavy
 - Might be sufficient for a lunar orbit mission
 - Feasibility studies only of larger 130 ton vehicle
- Current lunar program is focused on robotic missions
 - Chang’e 1 in 2007
 - Chang’e 2 orbiter in 2010
 - Chang-e 3 lander/rover planned for 2013
 - Sample return in 2017

China (4)

- China also is planning robotic Mars missions
 - First Chinese Mars probe, Yinghuo-1, scheduled for launch by Russia later this year as part of Russia's Phobos-Grunt sample return mission; Yinghuo-1 is a Mars orbiter
 - First Chinese Mars probe on Chinese rocket possible in 2013 or 2016
- China has a slow but steady space program with the breadth of the U.S. and Russian programs, but takes everything at its own pace
 - Assertions they are “racing” US to moon mostly wishful thinking on the part of some U.S. advocates and “me-too’ism” on the part of their Chinese counterparts
 - Focus today is Earth orbit, with slow but steady program
- China's space program is a “mystery within a maze” – Joan Johnson-Freese.
 - Extremely difficult to separate wheat from chaff in the many public statements of various individuals.

India

- If there's a space race, it's in Asia!
- India aspirations about human missions to the Moon most likely in response to China's pronouncements
- India has much further to go than China to accomplish a human mission to the Moon, much less Mars

India (2)

- Interest in HSF most likely driven chiefly by China's achievements and aspirations, but --
 - Two Indian or Indian-born astronauts have flown already*
 - Rakesh Sharma, flew on Soviet Soyuz T-11 mission to Salyut 7 in 1984
 - Kalpana Chawla, member of ill-fated space shuttle Columbia crew
 - Official human spaceflight program (per ISRO website) is a LEO mission, no date projected
 - Unofficially ISRO leaders have asserted dates anywhere from 2015-2017 for first LEO flight
 - Have also said astronaut to Moon by 2020
 - Sharma complained to [The Times of India](#) on Gagarin 50th anniversary about how long it is taking the Indian government to commit to a human mission

*NASA's Sunita Williams is sometimes identified as an Indian-born astronaut, but she was born in Ohio; her father was born in India

India (3)

- To do it, need reliable, big launch vehicle
 - India's largest launch vehicle, GSLV, failed three of the last four times it launched (twice in 2010); total record is four successes and three failures.
 - 2-2.5 tons to GTO
 - Developing a Mark III version for 4 tons to GTO
- Also need reliable spacecraft
 - Chandrayaan-1 robotic lunar probe failed prematurely, though instruments acquired impressive data so the spacecraft's early failure attracted little attention

Largest Launch Vehicles

- U.S.
 - Existing: Delta IV Heavy (22.5 tons to LEO; 13 tons to GTO)
 - Planned: NASA's HLLV/Space Launch System (TBD, but 60-130 tons to LEO)
 - Announced: SpaceX's Falcon Heavy (53 tons to LEO)
- Russia
 - Existing: Proton M (21 tons to LEO; 5.5 tons to GTO)
- China
 - Existing: Long March 3A (7.2 tons to LEO; 2.5 tons to GTO)
 - Planned: Long March 5, first launch in 2014? (25 tons to LEO)
- India
 - Existing: GSLV (5 tons to LEO; 2.5 tons to GTO)
 - Planned: GSLV Mark III (4 tons to GTO)
- By comparison
 - Europe's Ariane 5 (17 tons to LEO; 10.5 tons to GTO)
 - Japan's HII-A (11.7 tons to LEO; 5.8 tons to GTO)

Data on existing vehicles from FAA's [Commercial Space Transportation: 2010 Year in Review](#). Japan's new and more capable HII-B was not included in that report.

Conclusion

- Many space advocates in the major spacefaring countries want a bold program that involves sending people to beyond LEO destinations, especially the Moon and Mars
- Generally, there is little evidence that the populace or governments of those countries agree that that is a national priority worth the needed investment
- India and China vie for leadership among “developing” or “emerging” economies, and human spaceflight is one area where they are likely to compete, but China is far ahead
- Russia, China and India probably will someday send people beyond LEO, but no evidence it will be soon