National Space Society Space Settlement Campaign Supports Elon Musk's Mars Settlement Plans

National Space Society provides a statement on Elon Musk Mars Plans. Plans for a Space Settlement Summit, the Space Exploration and Development Act, and the NSS Space Settlement Roadmap are discussed.

(September 27, 2016) At today's meeting of the International Astronautical Congress (IAC) in Guadalajara, Mexico, Elon Musk, CEO of Space X, announced his bold plan to build a city on Mars. For over 40 years the National Space Society has led advocacy for space settlement. According to Mark Hopkins, economist and Chair of the Executive Committee of the National Space Society, "The vast majority of the resources of our solar system lie in space rather than on the Earth. By settling Mars and other locations in space we can overcome the resource limits of Earth leading to a hopeful, prosperous future for all of humanity."

During the talk Musk detailed the Interplanetary Transport System (ITS) for the first time. The first stage of the ITS towers 77.5 meters with a diameter of 12 meters and uses 42 Raptor engines to provide a total of 28-million lbs of thrust. The second stage is 49.5 meters long, 17 m in diameter, uses 9 Raptor engines, and comes in both a crew/cargo model and a tanker model. Musk's plans are based on four key approaches: full reusability of all components, refueling in orbit around Earth, refueling on Mars with locally produced propellant, and using a rocket fuel (methane/oxygen) that can be easily manufactured on Mars. Musk envisions that the eventual cost of a ticket to Mars will be in the $100K-$200K U.S. dollars range, allowing ordinary people to eventually travel to Mars.

What has been a bold vision of the future for humanity is now becoming reality. Humanity has begun the first concrete steps towards space settlement. The next decade will be one of the most pivotal in human history. Today we are beginning the journey to becoming a multiplanetary species.

In recognition of these momentous developments taking place the National Space Society is convening the first "Space Settlement Summit" in January to bring together leading people, companies and organizations that are making space settlement a reality. Participation in this event will be by invitation only and limited to entrepreneurs, scientists, engineers, venture capitalists, and thought leaders deeply involved in making space settlement a reality. The objective of the event will be to show the synergistic in-space ecosystem that is emerging; to facilitate a convergence of interests and opportunities among the key players; and to identify critical issues along the path to space settlement. We are at the dawn of a new era for humanity and the National Space Society is continuing its role as the leading voice for space settlement.

Musk's reveal of his Mars colonization plan follows the announcement September 12th of the Blue Origin "New Glenn" heavy-lift vehicle by Jeff Bezos. The New Glenn is 7 meters in diameter and comes in both a two stage and a three stage version. The reusable first stage is powered by seven BE-4 engines fueled by liquid natural gas and liquid oxygen, providing 3.85 million pounds of thrust. The second stage uses a single BE-4 engine, and the optional third stage a single liquid hydrogen-oxygen BE-3 engine, the same engine used in the flight proven reusable New Shepard sub-orbital vehicle.

"The New Glenn is a major step forward for commercial space," said Dale Skran, NSS Executive Vice President. "With the SpaceX ITS and Falcon Heavy, the United Launch Alliance Vulcan, and the Blue Origin New Glenn operational, the U.S. will have four domestic options for commercial medium to heavy lift. This

will allow NASA to make use of commercial heavy lift services with greater confidence than if only a single operator existed."

The U.S National Space Policy of 2010 states "To promote a robust domestic commercial space industry, departments and agencies shall: Purchase and use commercial space capabilities and services to the maximum practical extent when such capabilities and services are available in the marketplace and meet United States Government requirements."

"NASA ought to welcome the usage of the ITS, Vulcan, the New Glenn and the Falcon Heavy in future NASA planning," said Skran. "NASA can only benefit from the existence of multiple commercial medium to heavy lift providers with re-usable first stages that offer the possibility of significant cost reductions."

MILESTONE 2 on the NSS Space Settlement Roadmap is titled "Higher Commercial Launch Rates and Lower Cost to Orbit" (http://www.nss.org/settlement/roadmap/RoadmapPart2.html). Future NASA usage of commercially available partially or fully re-usable medium to heavy lift vehicles will be critical to achieving this milestone.

"Competition like that seen between Blue Origin and SpaceX is key to rapid progress in space," said Bruce Pittman, NSS Senior Vice President. "Elon just presented a plan for settling the solar system in this century that is realistic and affordable. In my paper, 'A Pathway to a Thriving Commercial Space Economy' at IAC, I also laid out a path forward to a growing economy in space that produces new opportunities for all."

Musk's plan's address MILESTONES 15 ("Logistics System"), 16 ("Base"), and 17 ("A True Martian Settlement) in the evolving NSS Space Settlement Roadmap (see http://www.nss.org/settlement/roadmap). NSS supports the exploration, development, and settlement of space, including free space, the Moon, asteroids, and other locations in addition to Mars.

NSS has been pushing hard via legislative outreach in cooperation with the Alliance for Space Development to make space development and settlement part of the objectives that guide NASA. In March 2016 Rep. Dana Rohrabacher introduced H.R.4752 the "Space Exploration, Development, and Settlement Act (see https://www.congress.gov/bill/114th-congress/house-bill/4752/text) to make development and settlement of space part of the fundamental law governing NASA.

More recently, on September 21, 2016, the Senate Commerce, Science, and Transportation Committee marked up S.3346, the NASA Transition Act of 2016. This bi-partisan Bill, co-sponsored by Senators Cruz, Nelson, Rubio, Peters, Wicker, and Udall, contains the following ground-breaking statement:

Section 202(a) of the National Aeronautics and Space Administration Authorization Act of 2010 (42 U.S.C. 18312(a)) is amended to read as follows:
''(a) LONG-TERM GOALS—The long-term goals of the human space flight and exploration efforts of NASA shall be—
''(1) to expand permanent human presence beyond low-Earth orbit and to do so, where practical, in a manner involving international, academic, and industry partners; and
''(2) the peaceful settlement of a location in space or on another celestial body and a thriving space economy in the 21st century.''

The entire S.3346 "NASA Transition Act of 2016" can be found at: https://www.congress.gov/bill/114th-

congress/senate-bill/3346/text . NSS applauds the Senate for taking this forward-looking position in favor of space development and settlement, but much remains to be done to make space development and settlement a reality. Citizens can join NSS in the fight for a better future at www.nss.org.

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About the National Space Society: NSS is an independent non-profit educational membership organization dedicated to the creation of a spacefaring civilization. NSS is widely acknowledged as the preeminent citizen's voice on space, with thousands of members and supporters, and over 50 chapters in the United States and around the world. The Society publishes Ad Astra magazine, an award-winning periodical chronicling the most important developments in space. To learn more, visit the NSS Website (www.nss.org).