Created China

China's Journey to Space

From Dream to Reality

China Intercontinental Press

China's Journey to Space: From Dream to Reality

By: Xu Jing

China Intercontinental Press

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Foreword

At 1:30, early in the morning of December 2nd, 2013, the "Chang'e 3" lunar probe flew to the Moon with the "Yutu" lunar rover on board, which realized China's first soft landing onto the Moon. The exploration of outer space has long been the relentless pursuit of mankind: In 1961, Yuri Alekseyevich Gagarin, cosmonaut of the former Soviet Union, spent the most precious 89 minutes of his life in orbit of the Earth, starting the journey of mankind into space; In 1969, American astronaut Neil Alden Armstrong took the famous "small step" on the surface of the Moon, marking mankind's setting foot on a land other than the Earth for the first time…

China's space industry started from the 1950s and 1960s, and the successful launching of China's first man-made earth satellite Dongfanghong 1 in 1970 ushered China into the space era.

Through more than five decades' efforts, China's space industry has probed an innovative approach independently which is suitable for Chinese national circumstances. The manufacturing and launching of carrier rockets, artificial earth satellites of all kinds, manned spacecraft and lunar probes are all milestones which represent leapfrog development in China's space industry.

Chinese poet Li Bai had written such beautiful verses: "There must be a day when I will ride on winds and waves, set my cloud-white sail and cross the sea to the shore of ideals." By seizing the opportunities brought by the "Twelfth Five-year Plan" (2011-2015), China's space industry will stand at a new start point for fulfilling new space dreams.

Contents

Foreword 1

Milestones in the Development of China's Space Industry 2

1. Initiation of China's Aerospace 5
2. Exploration of China's Manned Spaceflight 20
3. A New Journey for Lunar Exploration 31

Long March Rocket Family 38

1. LM-1 Carrier Rocket Series: China's First Carrier Rocket Models 41
2. LM-2 Carrier Rocket Series: Sending Shenzhou Spacecraft into Space 42
3. LM-3 Carrier Rocket Series: Ladder to the Moon 47
4. LM-4 Carrier Rocket Series: Sending Satellites into Sun Synchronous Orbit 55

Chinese Satellites in Space 58

1. Widely-used Earth Observation Satellites 60
2. Communications Satellites as Bridges for Space Information 76
3. Beidou Navigation Satellites 81
4. Experimental Satellites for Scientific and Technological Development 86
5. Chinese Satellites in Global Market 90

The Shenzhou Spacecraft: Chinese Nation's Millennium Dream of Spaceflight Comes True 92

1. China's Self-developed Flying Vehicle: The Shenzhou Spacecraft 95
2. Shenzhou 5 Mission: First Manned Spaceflight 97
3. Shenzhou 6 Mission: First Multi-manned and Multi-day Spaceflight 100
4. Shenzhou 7 Mission: First Spacewalk 102
5. Shenzhou 8 Mission: First Rendezvous and Docking in Space 106
6. Shenzhou 9 Mission: Travel of First Female Astronaut to Space 110
7. Shenzhou 10 Mission: First Applied Spaceflight 115

Travel of Chinese Astronauts to Space 122

1. "Cradle" of Chinese Astronauts 124
2. Selection and Training of Chinese Astronauts 126
3. Unusual Space Life of Chinese Astronauts 132
4. "Feitian" Space Suit: Special Space Suit for Chinese Astronauts 140
5. Chinese Space Food 142

The Wonderful Beginnings and Progress of the Chang'e Program 144

1. First Lunar Exploration by Chang'e 1 147
2. Second Step in Lunar Exploration by Chang'e 2 159
3. First Landing on the Moon by Chang'e 3 166

Desert, Mountain and Ocean: Spaceports for China's Satellite Launch 172

1. First Spaceport for Manned Spaceflight: Jiuquan Satellite Launch Center 174
2. Aerospace Town on the Plateau in Northwestern Shanxi: Taiyuan Satellite Launch Center 182
3. "Moon City" Helping Chang'e with the Journey to the Moon: Xichang Satellite Launch Center 184
4. Future Manned Lunar Landing Spaceport: Wenchang Satellite Launch Center 190

The Broad Prospects of China's Aerospace Sector 192

1. New Carrier Rockets 194
2. Various Artificial Earth Satellites 196
3. Future Manned Space Station 198
4. Deep Space Exploration in Progress 199

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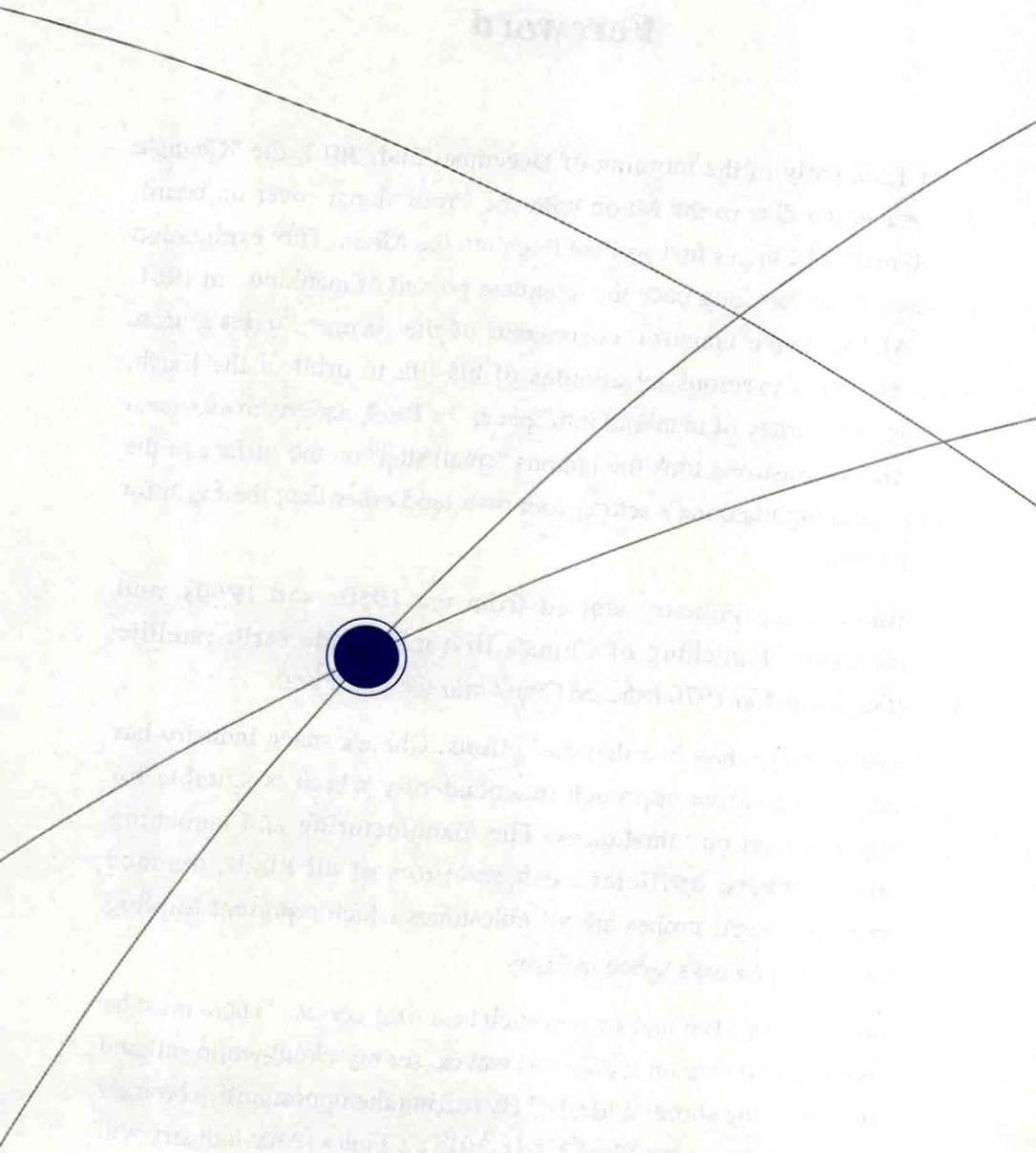

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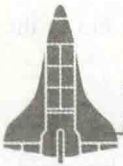


Milestones in the Development of China's Space Industry

The development of China's space industry is marked by three milestones:

On April 24th, 1970, China's first artificial earth satellite, Dongfanghong 1 (DFH-1, "Dongfanghong" literally means "the east is red"), was successfully launched and operated in orbit, ushering in a new era in the development of China's space industry.

On October 15th and 16th, 2003, China achieved great success in the launch of its first manned spacecraft, Shenzhou 5, into space, becoming the third nation in the world to develop the capability of independently carrying out manned spaceflight programs.

On October 24th, 2007, China's first lunar exploration satellite, Chang'e 1 (named after the goddess Chang'e who reached the Moon in an ancient Chinese fairy tale), flew to the Moon and from November 20th began to send back clear Moon images, marking that China had become one of the few countries in the world with deep space exploration capabilities.

Initiation of China's Aerospace

"When the east is red, the sun rises..." When the music "The East Is Red" was broadcast in space, it marked that the Chinese nation had taken the first step towards flight into space and also let us remember the glory days.

Proposal for the Man-made Satellite Program

At the end of 1956, Nie Rongzhen was made Vice Premier of the State Council to take charge of national science and technology work. In the face of the challenges of the world today and of the future, and despite illness, this battle-scarred general went on to lead China's scientific and technological force.

In 1957, the first man-made satellite in the world was sent into space. Coordinated by the Chinese Academy of Sciences (CAS), Qian Xuesen, Zhao Jiuzhang, Guo Yonghuai, Lu Yuanjiu and other experts developed the draft for the man-made satellite development program with the "three-step" development idea: first, to launch sounding rockets; second, to place satellites weighing 100-200 kg into space; and third, to send satellites weighing thousands of kilograms into space.

Former Site of 581 Group

CAS made man-made satellite development its first priority among

scientific and technological tasks for 1958, for which China's first satellite group, "CAS 581 group", was set up with Qian Xuesen as the head and Zhao Jiuzhang and Wei Yiqing as associate heads. Under their leadership, three design institutes were established: the first design institute was engaged in overall design of satellites and carrier rockets;

▶ Ground Tracking Station

▶ Upper Stage of LM-1 Rocket

the second institute was dedicated to the development of the control system; and the third institute was committed to the development of space exploration instruments and research on the environment in space.

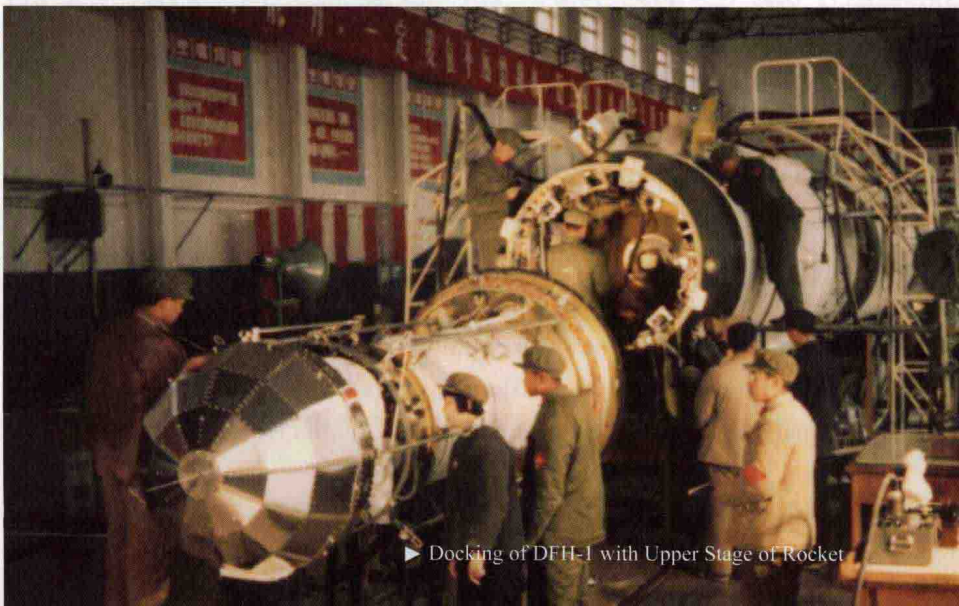
At that time, due to extremely limited economic support and technical strength, China had to give priority to the development of missiles and atomic energy for the sake of national defense. In terms of technical strength, China had just begun to pattern short-range missiles and had not developed the ability to independently design carrier rockets. Only after China's rocket technology achieved further development could China develop large rockets able to carry man-made satellites. Under these circumstances, studies were started looking into individual technologies for the man-made satellite program.

The newly established satellite group had to start from scratch, empty-handed. Without an office, they rented several rooms at Xiyuan Hotel in the western suburbs of Beijing. Without advanced computers, they used hand-operated computers. Without desks, they developed the design

drawings on the cement floor. With a set of pliers, two files, several aluminum sheets and ternary plates and a dozen candles and several flashlights, they started to design and develop the prototypes of Chinese satellites and carrier rockets.

On the National Day in 1958, the Exhibition for Leapfrog Achievements of CAS in Natural Science had its curtain raised at the Beijing Zhongguancun Biology Research Institute. For the exhibition, the satellite group rushed out a set of carrier rocket design drawings, ground radar photos and satellite and rocket models. As a result, the exhibition created much of a stir, not only receiving recognition and encouragement from all walks of life, but also attracting the attention of the central leaders.

In 1961, several scientists including Qian Xuesen and Zhao Jiuzhang decided to pool together scientists from various disciplines by organizing occasional interplanetary travel forums so that they could first figure out the theoretical side of the relevant space technology problems and, thus, lay a solid theoretical foundation for launch of man-made satellites in the next phase.



► Docking of DFH-1 with Upper Stage of Rocket

Qian Xuesen's speech at the forum was entitled "The current state of rocket power for interplanetary travel in the Soviet Union and the United States and its prospects". The speech lasted more than an hour and Qian Xuesen finished it in one breath. Throughout Qian's speech, each expert and scholar present was highly excited. After Qian finished his speech, Pei Lisheng, Zhu Kezhen, Bei Shizhang, Zhao Jiuzhang, Guo Yonghuai and other scientists expressed their opinions, which were previously borne in silence, one after another, enlivening the academic atmosphere of the forum…

The first interplanetary travel forum aroused an enthusiastic response from the scientific community. It was widely believed that forums of this kind were of great significance and should continue to be held from time to time in the future. Accordingly, in the three years that followed, CAS convened 12 similar interplanetary travel forums in total. At each

▶ Refueling

▶ DFH-1 Satellite under Test

of the forums, an expert made a keynote speech, which was followed by a discussion about this speech with the attendees where they could fully put forward their opinions and suggestions. After each forum, the opinions expressed were summarized and made into articles, with 200 copies printed and issued to relevant departments. Finally, the papers read out at the forum were also collected into the "Collection

of Interplanetary Travel Materials" published by the Science Press, and received wide spread attention from the academic community and other walks of life. Consequently, for the study and discussion of China's man-made satellite technology issues, a preliminary leadership and a structured plan for an organization began to take shape and achieved remarkable results, creating the circumstances necessary for the future creation of the man-made satellite program.

▶ Music Device on DFH-1

June 29th, 1964 saw the successful launch of China's first self-developed ballistic missile, and October 16th witnessed the successful detonation of China's first atomic bomb. Successful development of the missile and the atomic bomb laid the technical foundations and provided a guarantee of the conditions needed for the launch of man-made satellites. Ultimately, the development of man-made satellites was now on the agenda.

At the end of 1964, Premier Zhou Enlai received a letter from Zhao Jiuzhang regarding the commencement of the development of man-made satellites. At the same time, after a thorough analysis of the points in favor for China's development of man-made satellites, Qian Xuesen, advocate of China's space cause, also put together a man-made satellite development plan. In April, 1965, the National Defense Science and Technology Commission drafted "The Report on the Man-made Satellite Program". After approval from the central authorities, the decision in favor of developing man-made satellites had finally been made. This

marked the official commencement of China's man-made satellite program for design and organizational research.

▶ Satellite Assembled into Upper Stage of Rocket

▶ Assembly of DFH-1 Satellite

Late during one night in April 1965, satellite expert Pan Houren received a call out of the blue from Zhao Jiuzhang. When Pan rushed to Zhao's home, Guan Zhaozhi, Head of CAS's Institute of Mathematics, was already there. After a brief introduction to each other, Zhao Jiuzhang said eagerly: "At the end of last year, I wrote to Premier Zhou, explaining that we had already met the requirements for developing man-made earth satellites and, for the purpose of missile development, suggested a combination of missile shooting tests and a satellite launch, so as to achieve double gains." After pausing for a while, Zhao turned pages of a little notebook in his hand and continued excitedly: "Now Premier Zhou has instructed us to work out a preliminary plan. Since 1958, we have been making preparations and looking forward to this day, and now it's coming at long last. However, just imagine if a satellite, several meters long, is sent into orbit and we can't control it and we end up leaving it floating like a balloon several kilometers away from us. So before we launch the satellite, we must set out satellite movement rules, orbit calculation, surveillance, control and forecast and tracking station layout. In this respect, CAS ought to take responsibility for the mission