Seventh Ministry of Machine Building

Less than one year after Tsien's return to China, he was appointed president of *Research Academy No.5* of the Ministry of National Defense. The Academy was created in May 1956, and it became China's first missile research establishment; the *Second Artillery* of the *People's Liberation Army (PLA)* would become the ballistic missile force. The Academy would be reorganized into the *Seventh Ministry of Machine Building* in 1965 and absorb at that time a number of other research, development, and manufacturing facilities. The ministry would subsequently become the *Ministry of Space Industry* on 19 December 1986.

Soviet Help

The Soviet Union offered crucial help to jump start the ballistic missile program. Two R-1 (SS-1) rockets built by Korolev's design bureau were provided to China in 1956. More advanced R-2 (SS-2) missiles reached the country in December 1957. The missiles were followed by extensive engineering documentation and equipment and a large number of Soviet specialists arriving to organize production of the R-2 in China. Simultaneously, 50 Chinese students were sent to study missile technology in a leading Soviet educational engineering institution, the Moscow Aviation Institute.

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R-2 (SS-2) in China

Establishing production of the Chinese R-2, designated model *1059*, created the foundations of the Chinese indigenous ballistic missile capabilities. More than 1400 organizations participated in this challenging undertaking and learned technology and manufacturing of various components, parts, and materials for the missile. The R-2 program was building, from scratch, the indispensable research, development, and manufacturing base for the new missile industry. At the same time PLA's 20th Corps and engineering units began construction of the *Jiuquan* missile test site in the Gobi desert. The number of students studying in the Soviet Union was also increased.

Jiuquan Missile Test Range

Dong Feng

The range of the R-2 was limited to 600 km (370 miles), which was a smaller flight distance than needed to hit American military installations in Japan. In addition, the missile was not capable of carrying the projected weight of the first

SOVIET BROTHERLY HELP

In 1950s the Soviet Union provided massive help in science and engineering to the newly established communist neighbor, People's Republic of China. Chairman Mao Zedong recognized in a speech in Moscow on 6 November 1957 that "the socialist construction of China has received the fraternal assistance of the Soviet Union in many areas" (Mao Zedong 1986, 764).

During these 10 years, the USSR Academy of Sciences trained 900 scientists from the PRC. One-thousand Chinese scientists and 2000 technical specialists visited the Soviet Union. More than 1500 Soviet scientists, engineers, educators, and doctors worked in Red China. In addition, about 3000 Soviet scientific and engineering books were translated to Chinese in 1949–1955.

A group of Soviet rocketeers that went to China to support transfer of the R-2 ballistic missile technology included 45 scientists and engineers from Korolev's design bureau and other organizations responsible for missile subsystems. Soviet specialists gave numerous lectures on rocket design, technical documentation, standards, materials, technology, and manufacturing processes and techniques. They worked closely with Chinese engineers on specific problems of rocket production, laying foundation of the Chinese missile research, development, and manufacturing base.

M. Gruntman, *Blazing the Trail. The Early History of Spacecraft and Rocketry,*
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EAST WIND

The first series of Chinese ballistic missiles was named *Dong Feng* (*East wind*) or *DF*.

When he attended an international gathering of communist and workers' parties in the USSR, Chairman Mao Zedong talked on 17 November 1957 to Chinese students and trainees studying in Moscow. Mao emphasized that the forces of socialism had surpassed the forces of imperialism. He said that "in the struggle between the socialist camp and the capitalist camp either the West Wind prevails over the East Wind, or the East Wind prevails over the West Wind ... . This is a war between two worlds ... . The East Wind is bound to prevail over the West Wind" (Mao Zedong 1986, 774, 775).

Picked up by the communist propaganda machine, this characterization by Mao Zedong gave the name to the country's first ballistic missiles.

SS-3 and SS-4 Denied

Chinese atomic bombs. Therefore, Research Academy No.5 initiated development of the new, more capable DF series of ballistic missiles; DF standing for *Dong Feng* or *East wind* in Chinese.

At first, Research Academy No. 5 sought to base its first missile design, DF-1, on the Soviet R-12 (SS-4) IRBM built by Yangel's design bureau. The Soviet Union, however, refused to provide this recently developed missile to China. Not being satisfied with "brotherly assistance" of Soviet comrades, the Chinese students studying in Moscow did their best to collect information on another ballistic missile, the Korolev's R-5 (SS-3), by copying restricted notes and talking to the instructors. But the Soviet Union considered the R-5 to be too advanced for transfer to another country.

One Sun in the Skies

There is room for only one truly Marxist sun shining in the communist skies. So, the disagreements between the USSR and PRC mounted, and the relations between two communist giants quickly deteriorated. (The late 1960s would even witness military skirmishes along the border.) So, the Soviet aid in the missile area was cut off, and Soviet specialists left Research Academy No.5 on 12 August 1960.

First R-2 Missile Rises

Chinese scientists and engineers learned diligently from their one-time Soviet brothers, as they demonstrated by a successful launch of the first R-2 from a newly established missile test site in September 1960, one month after departure of the Soviet mentors. This first fired R-2 was actually built in the USSR, but it was fueled by the Chinese-made propellants. The successful launch of the Chinese-made R-2 followed on 5 November, and two more missiles were fired in December of the same year.

In a short time, the PRC had become capable of developing its own ballistic missiles. The new Chinese-designed and built missile *DF-2* was expected to be capable of reaching any place in Japan with a 1500-kg (3300-lb) warhead. Tsien personally initiated development of another even more advanced long-range rocket similar in performance characteristics and configuration to the first Soviet ICBM R-7 (SS-6). This task was however too challenging for Chinese rocketeers at that time, and the program was cancelled in 1963.

DF-2

The ranges of the successively produced Chinese ballistic missiles were linked to specific targets. So, the first DF-2 was designed to deliver atomic bombs to Japan. (China demonstrated its atomic bomb on 16 October 1964. Then on 26 October 1966, the PLA successfully launched a ballistic missile with a live atomic

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Blazing the Trail

The Early History of Spacecraft and Rocketry

Mike Gruntman

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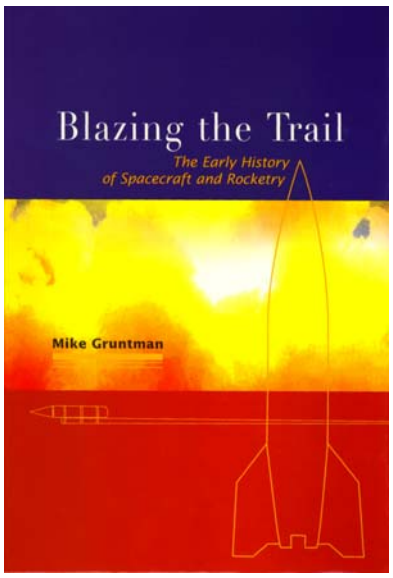
505 pages with 340 figures
Index: 2750+ entries, including 650 individuals



This book presents the fascinating story of the events that paved the way to space. It introduces the reader to the history of early rocketry and the subsequent developments which led into the space age. People of various nations and from various lands contributed to the breakthrough to space, and the book takes the reader to far away places on five continents.

This world-encompassing view of the realization of the space age reflects the author's truly unique personal experience, a life journey from a child growing on the Tyuratam launch base in the 1950s and early 1960s, to an accomplished space physicist and engineer to the founding director of a major U.S. nationally recognized program in space engineering in the heart of the American space industry.

Most publications on the topic either target narrow aspects of rocket and spacecraft history or are popular books that scratch the surface, with minimal and sometimes inaccurate technical details.

This book bridges the gap. It is a one-stop source of numerous technical details usually unavailable in popular publications. The details are not overbearing and anyone interested in rocketry and space exploration will navigate through the book without difficulty. The book also includes many quotes to give readers a flavor of how the participants viewed the developments. There are 340 figures and photographs, many appearing for the first time.

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