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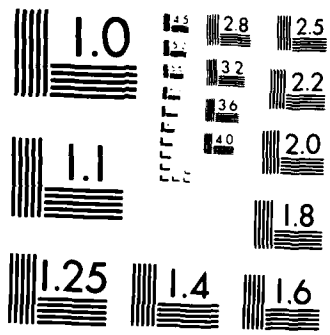

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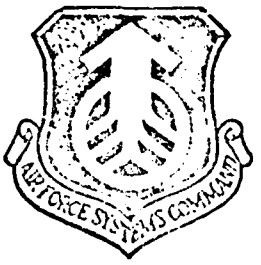
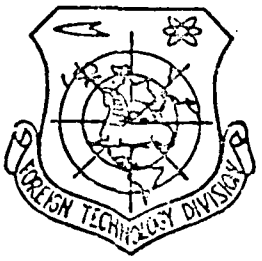


ONE ROCKET MULTIPLE SATELLITE LAUNCH TECHNOLOGY

by

Wu Ke



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ONE ROCKET MULTIPLE SATELLITE LAUNCH TECHNOLOGY

Wu Ke

China has launched three satellites with one rocket. An astrophysical probe satellite has gone into orbit precisely and is functioning normally. According to a despatch from the Beijing office of the New China News Agency dated September 20 1981, on that date China successfully launched an astrophysical probe satellite. This was the first time that China had used one carrier rocket to launch three satellites. The satellite entered orbit precisely, all systems were working normally, and it was transmitting back to Earth a continuous stream of scientific and experimental data.

The technology of launching more than one satellite with one rocket is quite recent. China is one of a small number of countries than has mastered this type of launch technique. In launch technology, particularly when there are special requirements, using one rocket to launch more than one satellite can be an advantageous method. It can prove to be the best method if two or more satellites are to be placed in nearly the same orbit at a fixed distance from each other to carry out a single experimental task in coordination. If the carrier rocket has excess carrying capacity, the advantages of this launch technique go without saying.

The United States was the first country to carry out a multiple

satellite launch. In 1960 the United States used one rocket to launch two satellites and in 1961 they achieved the launch of three satellites with one carrier rocket. On a number of occasions, the Soviet Union used one rocket to place in orbit eight satellites. More recently, the European Space Agency carrier 'Ariane' placed in geosynchronous orbit a European meteorological satellite and an Indian experimental communications satellite.

Generally speaking, as the weight and volume of more than one satellite is greater than that of an individual satellite, a successful multiple satellite launch frequently is an indication of enhanced carrier capacity. There are two indications of a completely successful man-made satellite launch: the first is that the satellite went into its predetermined orbit, and the second is that it is working normally. The first of these is guaranteed by the carrier rocket, and the second is dependent upon the satellite itself. There is a most critical aspect of placing a satellite in orbit and the satellite beginning to operate - this is the technique of achieving separation of the satellite from the final stage of the carrier.

There are two ways to launch more than one satellite with a single carrier rocket. The first of these entails placing several satellites in the same or nearly the same orbit at the same time. The second entails placing each satellite in a different orbit at separate times. This means that when the carrier rocket has reached a certain predetermined orbit and speed, the first satellite is released. The first satellite is allowed to assume the first orbital motion. Then, when the carrier rocket has flown on to another predetermined orbit and speed, the second satellite is released to take up the second orbital motion, and so on in this way until each satellite has been separately released to assume its own separate orbital motion. As can be seen from the point of view of technology, using one carrier rocket to place more than one satellite in different orbits is much more complicated and more difficult to master.

To accomplish either of the above-mentioned methods of multiple satellite launch requires very many technological problems to be resolved. Naturally it is more complicated from the point of view of technology to load more than one satellite into the satellite bay of a single carrier rocket at the same time than to load just one satellite. Once in orbit there is the problem of accomplishing satellite separation safely; then there is the problem that once one satellite has entered its separate orbit, the other satellites must leave the carrier rocket separately, the rocket and the satellites

A simplified Table Showing the Eight Previous Man-made Earth Satellites Launched by China

Sequence number	Name	Launch date	Satellite weight (kg)	Distance from the Earth (km)		Orbital period (minutes)	Inclination to equator (degrees)	Operating characteristics
				Perigee	Apogee			
1	Man-made Earth satellite	4.24.70	173	439	2,384	114	68.5	Broadcast 'The East is Red' on 20.009 mHz.
2	Scientific experimental satellite	3.3.71	221	266	1,826	106	69.9	Transmitted data to Earth on 20.009 and 19.995 mHz.
3	Man-made Earth satellite	7.26.75		186	464	91	68	All on-board equipment operated normally
4	Man-made Earth satellite	11.26.75		173	483	91	63	Motion normal. (Returned to Earth according to plan)
5	Man-made Earth satellite	12.16.75						Operated normally
6	Man-made Earth satellite	8.30.76						Operated normally
7	Man-made Earth satellite	12.7.76						Normal. (Precision return according to plan)
8	Man-made Earth satellite	1.26.78						Motion good. Scientific tasks completed. Successful return

must not be allowed to interfere with each other, and the carrier rocket must be precisely maneuvered to the next orbit. There is also the question to be solved of how to ensure that the radio equipment of all the satellites do not cause interference to each other, and that they operate in a coordinated way.

We know that the Earth is the only celestial body in the universe supporting human life. Human life is constantly affected by events taking place in space, in particular the many physical phenomena that reach the Earth from the Sun. For example, when there is a solar flare, all kinds of radiation disrupt the atmosphere and can cause weather changes on the surface of the Earth; the ionosphere can be disrupted affecting short-wave long-range ground communications; the magnetic field of the Earth can be disrupted affecting the navigation systems of aircraft and ships, and so on. At the same time, Earth-Sun space has been the most important area for human activity as far as space activity and military science are concerned. For this reason, research into these astrophysical phenomena has very serious significance.

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