

Rocket and Space Corporation Energia: The Legacy of S. P. Korolev
Apogee Books, Burlington, Ontario, Canada \$19.95
For IEEE Spectrum

Considering the fact that thirty years ago the CIA and the Pentagon were spending billions of dollars a year to catch glimpses of the Russian space and rocket hardware shown in this new book, the price is now right. And for that price, a curious engineer will see absolutely striking schematics and photographs of what used to be the USSR's greatest secrets - its rockets, space vehicles, and ground processing facilities.

During the years of the 'Space Race', the mysterious names such as "Vostok", "Venera", "Soyuz", and "Salyut" were accompanied by fuzzy photographs, if at all. And there were other mystery space vehicles that were tracked in secret by American military intelligence agencies, which had no names. Rumors flourished about secret rocket disasters, failed projects, and crashed spacecraft. Beyond these, space experts had no doubt there were even more types of space and missile hardware which never made it off the ground.

Most of them are here, in this book, in living color and crisp schematics. The hardware is described in some detail, with identifications of most features in the drawings.

It's still not everything. The book's title indicates that the range is only those vehicles built by the 'Energiya Rocket and Space Corporation' (RSC-Energia), located in the town of 'Korolev' in the northern suburbs of Moscow on the main highway to Yaroslavl. But as clearly shown in the overview chart at the end of the book, this group was at the very heart of the USSR's space and missile program. Almost all manned space vehicles, all lunar and planetary probes, all pioneering spacecraft of almost every type, came from this facility, under the leadership of the legendary Sergey Korolev (1906-1966), the 'Chief Designer'.

The early rockets (including a direct German V-2 copy) and payloads are shown, as well as more recent successes such as the Buran shuttle, whose only flight in 1988 was followed by the financial collapse of the Soviet space program. Many of the USSR's space stations of the past thirty years are pictured, but no hint is given that other manned space stations were built and flown by a competing firm, the Khrunichev Center (whose history photo album has yet to be translated and offered for sale).

The photographs in this book originally were published by RSC-Energia in 1994 in a large-format pamphlet available only in Moscow. But that cost \$75 cash and was available only in the firm's private museum, so copies were hard to obtain. This reprint by a Canadian firm fixes that problem.

The new edition is essentially the original 1994 edition with a few pages added. There are two extra photos of the new 'Yamal' communications satellite, and views of the actual 'Sea Launch' blastoff. Some proposals in 1994 for space station designs and heavy geosynchronous satellites have been dropped. Another page or two of explanatory text

was also added.

Most of the Russian language labels are precisely translated. Finding a few slip-ups brings joy to any reviewer, and the utter triviality of these errors shows how reliable the translation has been. My favorite errors are the altitude and range parameters for the Soyuz launch escape system, on page 89, which are shown as precise values (in meters) when they should say “Not less than” before the values. Also, the label for a curious radio antenna on an early spy satellite is mistranslated as “radio/reconnaissance antenna” as if there were two options, when the original Russian word actually described a standard ‘electronics eavesdropping’ antenna for intercepting enemy radar and microwave communications. Some events and dates in the post-1994 space chronology are a bit confused. These are nits that testify to the book’s quality.

The photographs which I found most striking were scenes of vehicles that during the ‘Space Race’ I never dared dream I’d ever see pictures of. The Soviet hardware built to send cosmonauts to the moon ahead of Apollo is all displayed in stunning detail, from the command module and the lunar landing module (but not the space suit, built by another firm) to the massive N-1 space booster, the largest launch rocket ever built by human hands. The projects failed, but almost no details (and no photographs) are provided here.

Along with satisfying our decades-old curiosity, a significant value of this book is in the details found in the photographs and drawings. They show an entirely different engineering approach to dozens of problems – propulsion, power, communications, thermal control, and more -- facing other engineers around the world. Because the details have been secret for so long, they are still “new” and are still capable of inspiring innovations and ‘out-of-the-box’ thinking in the minds of engineers who examine them.

The Soviet Union spent tens of billions of dollars acquiring the experience, and learning the lessons, shown in these photographs. Even within the USSR, these technological developments were kept so secret there were no ‘spin-offs’ and very little downstream exploitation of the accomplishments. Now at last, with the secrecy gone, we can harvest the valuable lessons and use them as inspiration for our future projects.