Fig. 16.11. Example of Corona satellite photographs. A low-resolution photo (top) shows the area of the Soviet Saryshagan antiballistic missile defense test range (presently in Kazakhstan) obtained by a KH-5 Argon mapping camera (Mission 9058A; 29 August 1963). Lake Balkhash is covered by fog on the right. Bottom high-resolution photos show (left) site 2 (KH-1; Mission 9009; 18 August 1960) with the guidance radar and (right) the area of long-range radars (KH-4; Mission 9035; 30 May 1962). In a missile defense “first,” the long-range “Hen House” radar (Dunai-2) detected a Kap-Yar-launched ballistic missile R-12 (SS-4) at a distance of 975 km. The radars at site 2 and two other similarly instrumented locations precisely followed the warhead that was intercepted by a V-1000 missile on 4 March 1961 (see also Fig. 16.12 on the next page). Courtesy of Mike Gruntman.
Fig. 16.12. Example of intelligence derived from the Corona program — a map of the Saryshagan antiballistic missile defense test range, ca. 1963. Related representative Corona photographs are shown in Fig. 16.11. The figure also illustrates the first “nonnuclear” intercept of a warhead by a missile (see also Fig. 16.11) accomplished in the Soviet Union by a team led by Grigorii V. Kisun'ko on 4 March 1961. (A photograph of Kisun'ko, 1918-1998, is shown in the right top corner.) Three precise guidance radars were located at the sites (circled on the map) forming an equilateral triangle with the side 150 km (93 miles). Each radar measured distance to the incoming ballistic missile warhead with a 5-m (16-ft) error. The two-stage V-1000 interceptor missile developed by design bureau Fakel of Pyotr D. Grushin was launched from a site marked “Launch Complex B.” The intercept with the accuracy 32 m (105 ft) was achieved at altitude 25 km (16 miles) 43.7 s after the interceptor missile launch. The interceptor was detonated 0.3 s before nominal intercept, releasing 16,000 spherical 25-g balls, each containing an explosive charge and a hard core made of carbide-tungsten-cobalt alloy. The released balls formed a uniform disk 150 m (500 ft) in diameter with high statistical probability to hit the target. On impact, the ball’s explosive charge detonated and destroyed a part of the target external wall with the hard core penetrating inside and damaging the nuclear charge of the warhead. The long-range radars similar to those first observed on the shore of Lake Balkhash were later spotted near Moscow, thus revealing deployment of the antiballistic missile defense system around the Soviet capital. Original map courtesy of Central Intelligence Agency; Kisun’ko photograph courtesy of the Russian Academy of Sciences. Courtesy of Mike Gruntman.
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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