Corona, the American image intelligence program was a large and expensive effort, but it was not the first operating American reconnaissance space system. The honor of being the first belongs to a small signals intelligence spacecraft GRAB that innocuously stood for a Galactic Radiation Background satellite. GRAB was an electronic intelligence (ELINT) satellite launched by the U.S. Navy on 22 June 1960.

The Naval Research Laboratory proposed GRAB in the spring of 1958, and President Eisenhower approved satellite launch in August 1959. The program emerged from the work of NRL's Radio Counter Measures Branch engaged in ELINT. An electronic engineer Reid Mayo had been involved in deployment of sensors designed to warn submarines under periscope when they were being detected by radar. Mayo made first estimates of the applicability of the detection technique on an Earth-circling satellite and reported favorable findings to his superiors at NRL.

The space radar-detecting sensor program was conducted under tight security. In addition to a classified ELINT payload, the satellite was designed to carry an open scientific instrumentation package SolRad (Solar Radiation). The Sol-Rad was developed by the NRL group of Herbert Friedman and measured solar radiation in x rays and in the hydrogen Lyman-α (121.6 nm) line, particularly during solar flares. This scientific experiment would establish the importance of solar x-ray emissions for the variability of the upper atmosphere and ionosphere. Friedman's scientific package provided an excellent cover for the ELINT mission.

The GRAB intelligence payload was designed to intercept Soviet air defense radar signals when flying over the USSR. Because the spacecraft did not have a recording device, it beamed intercepted signals down to several small receiving stations established near Soviet borders. These installations actually were small huts operated by two-man Navy teams that recorded signals on magnetic tapes. The tapes were then delivered by couriers to the NRL and then to the National Security Agency and the Strategic Air Command. NSA analyzed the pattern of the Soviet air defense radars including antenna scan rates, pulse repetition frequencies, types of radar, and their locations. The information obtained by GRAB was particularly important for SAC for plotting the routes, avoiding Soviet radars and air defenses, of its bombers in case of hostilities.

The omnidirectional GRAB antenna did not allow determination of radar locations. Air defense radars, however, usually did not point upward but rather circled in search of targets. Therefore, an incoming satellite first intercepted radar signals that later disappeared when the satellite was over the radar site and then reappeared again on the outbound trajectory. This pattern helped to locate radar sites.

The GRAB satellite was based on a 20-in. (51-cm)-diam spacecraft originally developed by the NRL for the Vanguard program. In the first ever dual launch of spacecraft, GRAB was designed to ride to orbit together with a much larger Navy's Transit satellite built by APL. The two satellites were attached together during launch and separated in orbit. During ascent, the spacecraft were spun up to 60 rpm. After separation, Transit 2A was despun while GRAB remained spinning.
16. Opening the Skies

M. Gruntman
*Blazing the Trail. The Early History of Spacecraft and Rocketry*, AIAA, Reston, Va., 2004 p. 410

Fig. 16.13. The first American operational reconnaissance satellite known as the Galactic Radiation Background (GRAB) satellite. The satellite was based on the original 20-in. (51-cm) design of the NRL’s Vanguard satellite. GRAB hitched a ride to space on 22 June 1960, with the APL’s navigational satellite Transit 2A. Photo courtesy of Naval Research Laboratory.
The Thor–Able launcher successfully placed the first operational GRAB in a 66.7-deg inclination orbit on 22 June 1960. The satellite was also known as SolRad I. It was in an elliptical orbit with apogee altitude 660 miles (1061 km) and perigee altitude 382 miles (614 km). The ELINT payload was turned on for the first time on 5 July, six weeks before the first successful Corona brought its photographs. GRAB is still in orbit with the same inclination, but its apogee and perigee altitudes have decreased to 561 miles (903 km) and 362 miles (583 km), respectively.

The ELINT payload of GRAB operated until August 1962. Its information revealed that the strength of Soviet air defenses was greater and its radars were more powerful than expected. In addition, GRAB identified radar signals from the rapidly growing Soviet antiballistic missile defense installations. Four more GRAB launches followed, with only one being successful.

By the early 1960s, the skies had been opened giving birth to space-based image intelligence and signals intelligence. Infrared early missile-launch warning space systems were also under development. In addition, a program to detect nuclear explosions in the atmosphere and in space for verification of international treaties was rapidly advancing. This latter program was started at the initiative of technical advisors supporting negotiations in Geneva on nuclear test ban treaties.

In September 1959, ARPA was instructed to undertake a research and development program to determine the feasibility of monitoring nuclear test ban treaties. The program was named Vela, and its component Vela Hotel (where the phonetic word “Hotel” stood for “high-altitude”) focused on detection of nuclear explosions in the upper atmosphere. (Other program components “Uniform” and “Sierra” corresponded to “underground” and “surface” nuclear explosions.) Detection of nuclear explosions in space was also desired because of its critical importance for antiballistic missile defense systems. The Vela Hotel research program became so successful that it provided interim operational detection capabilities. The program was a joint un-
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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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Book details (including index and reviews) at: http://astronauticsnow.com/blazingthetrail/

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