

**RAND'S ROLE IN THE CORONA PROGRAM:  
REMARKS ON THE 35TH ANNIVERSARY OF THE  
FIRST SUCCESSFUL MISSION**

**Michael D. Rich**

**P-8017**

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**Preface**

This paper contains the remarks made at an August 18, 1995 ceremony commemorating the 35th anniversary of the first successful film recovery from the CORONA satellite, the United State's first space reconnaissance system. The ceremony program is included.

RAND played a central role in the early days of America's space reconnaissance program and these remarks describe a portion of the details that have been publicly released. Readers wishing more information should consult M.E. Davies and W.R. Harris, *RAND's Role in the Evolution of Balloon and Satellite Observation Systems and Related U.S. Space Technology*, R-3692-RC, 1988, and the sources cited in that report; A.D. Wheelon, "Corona: The First Reconnaissance Satellites," *Physics Today*, February 1997, pp. 24-30; and C. Peebles, *The Corona Project*, the Naval Institute Press, 1998.



REMARKS AT ITEK OPTICAL SYSTEMS  
Lexington, Massachusetts  
Friday, August 18, 1995

Michael D. Rich  
Senior Vice President  
RAND

Thank you for the opportunity to be a part of this occasion. This is a humbling experience, because unlike most of you, I was not a participant in the events we are commemorating today. My credentials for being here are institutional. My predecessors at RAND--some of whom are current friends and colleagues--made numerous contributions to the development of spaceflight, satellite reconnaissance, and the CORONA program. Those contributions are a vital part of RAND's history and we are very, very proud of them.

I have an additional, personal reason for taking a special interest in today's events. My father, Ben Rich, spent much of his career at the Lockheed Skunk Works designing reconnaissance aircraft, most notably the U-2 and SR-71, so I have long been fascinated and impressed by technological achievements of the sort we are honoring today. I learned today that he had a long and close relationship with Itek and visited here many times.

I have been asked to say a few words about RAND's work in the 1954 to 1958 period and I am delighted to do so. I really need to start a little earlier.

Project RAND, which in 1948 became the independent RAND Corporation, published its first report on May 2, 1946 when it was still a part of Douglas Aircraft Company. Requested by General of the Army Arnold and General LeMay and entitled, "A Preliminary Design of an Experimental World-Circling Spaceship," it marked the start of a steady and continuous stream of studies on many aspects of satellites.

The first one to analyze the potential of satellites for reconnaissance missions was a February 1947 report by a team led by James Lipp. The years that followed saw RAND investigations into flight mechanics, hazards of space, materials, propulsion, communications, launch technology, among many other areas.

In 1951, Jimmy Lipp and Bob Salter led a team that conceived of a reconnaissance system that would use a two-stage hydrazine-liquid-oxygen rocket vehicle to achieve orbit. An orthicon television camera, like those used at the time in TV studios, was to take the pictures.

In 1954, the Atlas ICBM was under development and a new study, Project FEEDBACK, was undertaken that used the Atlas as the first stage of the launch vehicle. This study also proposed using a television camera to take the pictures. RAND recommended that the Air Force proceed with the development of a satellite reconnaissance system.

RAND's recommendation was briefed to General Twining, the Air Force Chief of Staff, and numerous others. It eventually led to the Pied Piper competition, which Lockheed won over RCA and Martin. In a few years, people reading about this competition will probably express surprise that Lockheed and Martin were actually once separate companies!

In addition to winning the competition, Lockheed hired away Bob Salter, Bruno Augenstein, and several other pioneers from RAND. But, at about the same time, we hired Bob Buchheim, known for his guidance and control expertise at North American, and Amrom Katz, a photoreconnaissance expert who worked for General Goddard, and continued our research.

Lockheed's design was not quite what RAND had recommended. It used a film camera, with on-board processing and readout. It was designated the WS-117L program.

In the meantime, RAND's work continued on many fronts. In November 1957, Mert Davies and Amrom Katz led a team that produced a recommendation for a reconnaissance system that could be ready before the Lockheed system. The system recommended in this RAND report used the Thor missile and the second stage of the Vanguard, a combination known as Thor-Able, instead of Atlas. It used film-recovery instead of on-board electro-optical processing, a reversal that was based largely on the pathbreaking research by two RAND staff members: Dick Raymond on data recovery rates and Carl Gazley on reentry techniques. In addition, RAND had published two reports on physical recovery of satellite payloads in 1956: Huntzicker and Lieske in June, Gazley and Masson in December. Few people realize that during this period, RAND conducted an extensive investigation of data-storage on magnetic tape, using Ampex Corporation as a subcontractor. This work helped stimulate the development of the commercial videorecorder industry, something we have been unable to talk about until CORONA was unveiled to the public.

An additional distinguishing feature of the November 1957 Davies-Katz concept was the use of a spin-stabilized payload stage, shaped like a football, together with a panoramic camera that would scan as the payload rotated. This idea grew out of Mert's investigation of Walt Levison's panoramic camera designs for use in high-altitude balloons and his knowledge of RAND's extensive investigation of spin stabilization. Mert was awarded a patent for the spinning panoramic camera in 1964.

This concept was briefed to the Air Force and, according to most CORONA histories, formed one of the early CORONA plans. The use of the THOR was part of Phase I of the WS-117L test plan, but with the stabilized AGENA as the upper stage in place of the spin-stabilized payload launched on the Able stage. The stabilize upper stage allowed use of the more sophisticated 24-inch focal length camera developed by Itek to be used in place of Fairchild's 6-inch focal-length camera with no image-motion compensation. This started the reliance on stabilized upper stages for reconnaissance, paralleling the contemporary practice with balloon and aircraft cameras. So, RAND's specific November 1957 proposals, while not part of the March-April 1958 final CORONA design, were a vital part of the general ferment leading to the CORONA program characteristics: use of Thor; physical recovery of payloads; and consideration of camera designs that did not rely on readout for data transmission.

I thought I'd end by speculating a bit on why RAND was able to play a constructive role during this exciting period. One important explanation lies in the power of interdisciplinary research, a hallmark of the RAND approach. This stimulated the cross-flow of ideas and experiences and made it easier for us to change or even reverse course when new insights indicated a need for a different approach to a problem.

Another was the tradition of encouraging self-initiated research. Work on electro-optical sensing systems, the potential of ICBMs, the feasibility of recovering satellite payloads, and on spinning panoramic cameras were all self-initiated by members of the RAND staff. The Air Force deserves abundant credit for fostering this kind of innovative environment at RAND.

Bud Wheelon, who is now one of RAND's trustees, called CORONA "a triumph of American technology." RAND is proud to have been a part of it.

Thank you for the opportunity to join you this afternoon.



**CORONA & ITEK**  
**August 18, 1960 - August 18, 1995**  
**An Extraordinary Story of the Cold War**

**Welcoming Remarks**

Mr. James Frey, President  
Litton/Itek Optical Systems

**1946**

**Cold War Anxieties Spawn Extraordinary Reconnaissance Concepts**

Gen. Bernard A. Schriever, USAF (Ret.)  
CORONA Visionary

**1952**

**Conceptual Visions Converted to Programs**

Col. Harold F. Wienberg, USAF (Ret.)  
CORONA Program Office

**1954**

**Reconnaissance Satellite Concept Evolves at RAND**

Mr. Michael Rich, Sr. Vice President  
RAND Corporation

**1954**

**Eisenhower's Critical Decisions**

Mr. Cargill Hall  
U.S.A.F. Historian

**1957**

**Itek is Born of Frustration, Luck and Unique Talent**

Mr. Richard S. Leghorn, Col. USAF (Ret.)  
Founding President of Itek

**1958**

**The CORONA Program; Innovation and Success**

Dr. Robert Salter  
RAND Satellite Study Team  
Lockheed Manager of CORONA/WS-117L

**1960**

**The View From the Other Side**

Mr. Sergei Khrushchev  
Senior Visiting Scholar  
Thomas J. Watson Jr., Institute for  
International Studies, Brown University

**1960**

**The CORONA Camera: A Technological Triumph**

Mr. Walter Levison  
Itek CORONA Pioneer

**The CORONA Legacy**

Dr. F. Dow Smith  
Itek's First Director of Research

Honorable Jeffery Harris, Director  
National Reconnaissance Office

**Litton**

**Itek Optical Systems**





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