Birth of Air Force Satellite Reconnaissance: Facts, Recollections and Reflections

First Gambit Launch,
12 July 1963

Prepared by the SAFSP Alumni Association, Summer 2015

Authors: Peter A. Swan, LtCol., USAF (Retired)
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PREFACE

The Alumni Association of the Office of Special Projects, Office of the Secretary of the Air Force is “a fraternal non-profit organization that provides a means of continuing contact between past members of SAFSP and helps maintain the organization's camaraderie and heritage.”

As such, the Alumni have pulled together a monograph that tells the story of an Air Force organization created to conduct this nation’s satellite reconnaissance. The history is revealed, as are insights from its members. Each alumnus was involved in the important mission and contributed in their own way. These stories are presented with history intertwined to present the full story of Air Force satellite reconnaissance.

This monograph is dedicated to all those who fought the Cold War in silence, not just within SAFSP, but to all the men and women whose stories may never get the attention they deserve.

The authors of this report thank those who contributed to the SAFSP mission and to this monograph:

- the members of SAFSP for their achievements over the years
- the “significant others” of each SAFSPer for their understanding and support
- contributors to this report for their insight into SP’s unique approach
- the members of parallel and supporting organizations around the nation who helped accomplish the SP mission.

Jack Kulpa

John E. Kulpa, Jr.
SAFSP Director, 1975-1983
President of SAFSP Alumni Association

ACKNOWLEDGMENT

This is the story of SAFSP, its unique organization, people, and the unbelievably critical mission it accomplished for our country. It captures the heart and soul of its people, their achievements, legacy and history. It is really the story of the SAFSP TEAM for none of this could have been achieved without the whole team. All of the SAFSP TEAM put their heart and soul into achieving its success.

AEROSPACE CORPORATION

Aerospace people provided the in-depth technical support that was needed to push the state-of-the-art while providing an operational capability. Aerospace was part of the immediate team that made design decisions, wrote and approved specifications, helped establish test requirements, and monitored all testing and launch operations. They were a key factor in creating the operational capability and results that were a major factor in the United States prevailing in the Cold War. They worked under the same uncompromising conditions that the military did, long hours and days away from home without, in most cases, their family knowing where they were. They faced the stress of working on state of the art technologies which were used operationally and the dreaded possibility of failure. They were truly an integral part of the immediate SAFSP TEAM.

CONTRACTORS

It may seem at times that the contractor designing and building the system is in an adversarial position with the government, but they were an integral part of the team. They designed and built the ground, launch and space systems, without them none of it would have been possible. Once the Program Office was sure that the contractor understood the problem, they had to rely strongly on them. Technically speaking they were in the driver's seat. They were dedicated, and brilliant, and definitely part of the SAFSP TEAM.

MILITARY SUPPORT

With a low profile and austere manning, SAFSP made use of supporting organizations, sometimes making unreasonable demands and then holding them responsible. Many functions, administrative or technical were passed to other organizations. In some cases personnel from other organizations worked directly with SAFSP. These supporting organizations contributed directly, and very substantially, to the SP mission. Special note must be made of the very close cooperation between SAFSP and Space Division. Space Division not only provided a security cover but many substantial functions that were better performed in the “white world.” Also special recognition is due to the east and west coast launch sites and the Satellite Control Facility. Their people were part of each launch and mission operations, real members of the SAFSP launch team.

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INTRODUCTION

No organization in the world is better at gathering intelligence from space than the U.S. National Reconnaissance Office (NRO). That statement has been true since the very beginning of the NRO. As threats to the Nation's security have evolved over the past 55 years, the NRO has responded carefully and quietly to keep national decision-makers informed and aware.

Today's NRO grew out of the combined efforts of three organizations in the U.S. Government. The Air Force office for satellite reconnaissance was called Special Projects, within the Office of the Secretary of the Air Force. Publicly it was referred to as SAFSP. Internally to the NRO, it became known as "Program A."

In the Central Intelligence Agency (CIA), satellite reconnaissance was the responsibility of the Office of Development and Engineering (OD&E), within the Office of the Deputy Director for Science and Technology (DDS&T). For security purposes, OD&E's role as the satellite arm of the CIA was referred to as "Program B" of the NRO.

Within the Navy, satellite reconnaissance was the responsibility of the Navy Space Project, PME-106. Again, for security purposes, the Navy office was referred to as "Program C" of the NRO.

This monograph describes the creation and life of SAFSP, which essentially represents the birth of Air Force satellite reconnaissance. Because many of those present at the beginning are still alive, recollections and "war stories" are included where available.

The SAFSP story officially began in the late summer of 1960, but the stage was set many years before. NRO Director Keith Hall captured the highlights in a presentation in 1997:

> "In the 1950s, our nation's very existence came under threat from the former Soviet Union. The Soviets were putting a great deal of energy and resources into building a strategic nuclear force and they were actively testing nuclear weapons. There was much debate in this country about whether or not they could launch a nuclear attack against us. There was also great deal of fear. Many

> Americans thought that Soviet capabilities had outstripped our own. There was anxious talk of the Bomber Gap[1] and the Missile Gap. … Decisions based on fear and imagination are generally bad ones. Our leaders needed real, concrete information on Soviet military capabilities. Without that, they had no way to build weapons that could deter a Soviet attack. They had no way to decide whether or not a threat justified the use of our own nuclear weapons. To base a decision like that on fear would be disastrous. But hard information about the Soviet Union was hard to come by. It was a closed society. Borders were tightly controlled and Soviet citizens had learned that contact with foreigners, particularly Americans, could carry grave consequences. Moreover, the country was enormous, spanning 11 time zones and some of the world's harshest and most inhospitable terrain. Traditional methods of intelligence collection couldn't give us the information that we needed."[2]

The U.S. had tried several approaches for gathering intelligence over the Soviet Union, including overflight treaties as well as low-flying aircraft and even balloons.

> "As early as 1955, officials in both Moscow and Washington had grown concerned about the relative nuclear capabilities of the Soviet Union and the United States. Given the threat that the nuclear arms race posed to national security, leadership in both countries placed a priority on information about the other side's progress. At a conference in Geneva in 1955, U.S. President Dwight Eisenhower proposed an "open skies" plan, in which each country would be permitted to make overflights of the other to conduct mutual aerial inspections of nuclear facilities and launch pads. Soviet leader Nikita Khrushchev refused the proposal, continuing the established Soviet policy of rejecting international inspections in any form."[3]

[1] The "bomber gap" was the unfounded belief in the Cold War-era US that the Soviet Union had gained an advantage in deploying strategic bombers. Widely accepted for several years, the gap was used as a political talking point in order to justify greatly increased defense spending. One result was massive buildup of USAF bomber fleet, which peaked at over 2,500 bombers, in order to counter the perceived Soviet threat. Surveillance flights utilizing U-2 aircraft indicated that the bomber gap did not exist. http://en.wikipedia.org/wiki/Bomber_gap

[2] Hall, Keith, Speech by Director NRO at SAFSP Alumni Holiday Party, 6 Dec 1997. http://fas.org/irp/nro/hall3.htm

[3] https://history.state.gov/milestones/1953-1960/u2-incident

In his book on his White House years, President Eisenhower places the issue of satellite overflight in perspective. This interchange between the President and the Premier was in the spring of 1960.

> "President Eisenhower had explained the American need for overflight information to his French and British counterparts in terms they found acceptable, and in the course of an angry exchange between the President and Premier Khrushchev, the Premier had proclaimed that he was concerned only with airplanes: "Any nation in the world who wanted to photograph the Soviet areas by satellites was completely free to do so."[4]

In 1956, the CIA started reconnaissance flights using U-2 spy planes over the USSR. When Francis Gary Powers' U-2 was shot down by the Russians in May of 1960, it was an enormous political embarrassment for the United States. Clearly, we needed a way to obtain information that would not put our people and our international reputation at risk.

Fortunately, several years earlier, President Eisenhower had attached the highest priority to a top secret program to develop reconnaissance satellites. After a series of initial failures, in August of 1960 the U.S. successfully launched the Corona system on Discoverer XIV and on August 18 recovered the first photographs from space. Ironically, it was the same day that Gary Powers was brought to trial in Moscow.

Jack Kulpa

Discoverer XIV was launched only eight days after Discoverer XIII. As Bill King put it, we didn't have time for accident investigations on the first 12. We were learning on the next launch.

With the success of this launch, the amount of intelligence we could collect on the Soviet Union and other parts of the world increased exponentially. Director Hall described the impact:

> "Because satellite reconnaissance was so extraordinarily important to our national security, we couldn't afford to have it bogged down in bureaucracy. The National Reconnaissance Office was established to develop and operate these capabilities outside the

[4] D.D. Eisenhower, The White House Years: Waging Peace, 1956-1961, Doubleday, 1965. (Found in Robert L. Perry's Management of the National Reconnaissance Program 1960-1965, Volume V, in A History of Satellite Reconnaissance, pg. 22.)

> normal government channels. The new organization had to operate under the strictest secrecy for a number of reasons. First, we had to avoid international opposition to the use of satellite reconnaissance over foreign territory. Second, we had to keep this new technology from falling into the hands of our adversaries. Third, we had to keep intelligence derived from this source under tight control so that our adversaries would not find out the type of information we could collect and figure out how to hide it from us in the future. For these reasons, we could not even acknowledge the existence of the NRO. The people who worked for the NRO, including the men and women of SAFSP, could not discuss the specifics of their jobs or reveal any information that would confirm that we were using satellites for reconnaissance. More often than not, what SAFSP people were doing, and locations they were visiting, were highly classified [in order to make it more difficult for an adversary to identify a mission based upon a contractor and technology, such as openly relating Corona to Eastman Kodak to film]."[5]

President Johnson was comparing the NRO's achievements against the public's knowledge of NASA's achievements, when he made the following statement: "I wouldn't want to be quoted on this, but we've spent thirty-five or forty billion dollars on the space program, and if nothing else had come out of it except the knowledge we've gained from space photography, it would be worth ten times what the whole program has cost. Because tonight we know how many missiles the enemy has, and it turns out our guesses were way off."[6]

Lyndon Baines Johnson, March 17, 1967

When SAFSP was created in response to Presidential recognition of a national imperative, four operational tenets captured the sense of urgency:

- Direct access to national leadership
- Covert management and operations
- Highest national priority
- Rapid procurement

[5] Hall, Keith, Speech by Director NRO at SAFSP Alumni Holiday Party, 6 Dec 1997. http://fas.org/irp/nro/hall3.htm
[6] http://gizmodo.com/5994202/how-the-us-built-its-super-secret-spy-satellite-program

The foundation of SAFSP successes over 30+ years of providing reconnaissance intelligence to the Nation consisted of three management principles:

- Strong dedication to mission
- Empowerment at all levels
- Reporting by exception

Over the years, SP had many missions assigned to it under the broad definition of overhead reconnaissance. This monograph focuses on recently declassified imaging satellite programs, such as Gambit and Hexagon, which took photographs from space. The strengths of the "SP" approach to program management could provide valuable lessons for future national crises.

With this introduction to set the stage for the SAFSP story, the remainder of this monograph covers the following topics:

- Chapter 1: Air Force Space Reconnaissance before 1960
- Chapter 2: The Life and Times of SAFSP
- Chapter 3: SAFSP Program Management
- Chapter 4: SAFSP Reconnaissance Satellites
- Chapter 5: SAFSP Leadership
- Chapter 6: SAFSP's Legacy

CHAPTER 1: AIR FORCE SPACE RECONNAISSANCE BEFORE 1960

Chapter 1 addresses key events of the 1940s and 1950s that set the stage for the creation of SAFSP in the summer of 1960:

- Early Air Force support
- Initiation of Weapon System (WS-117L) in 1953
- Initiation of the ICBM program in 1954
- Sputnik launch in 1957
- Initiation of Corona in 1957
- WS-117L moved to Los Angeles in 1957
- "Missile Gap" concerns raised in 1958
- The Fledgling Air Force Space Cadre

Early Air Force Support

General Hap Arnold led the Air Force into the second half of the 20th century convinced that the Air Force should be the Nation's leader in aerospace. His conviction led to growing interest (and funding) related to space technology. Several initiatives followed:

- A 1942 study by Douglas Aircraft described the possibility and feasibility of reaching and conducting operations in space including reconnaissance operations. The study was subsequently classified BYE-1 (the NRO's security control system described in Appendix A).
- The Air Force Scientific Advisory Board (under the name Scientific Advisory Group) was created in 1944 with General Arnold as the military director and Dr. von Kármán as the board chair.
- Research activities were supported with additional funding. Despite the national urgency of the Cold War, though, space technology lagged behind other strategic concepts.
- Buoyed by a seminal RAND study in 1948, the Air Force took an early interest in understanding space as a mission. The Air Force continued funding RAND to evaluate this new theater of operations, which led to several reports during the early 1950's.
- Technological and programmatic education in scientific fields was

expanded at the Air Force Institute of Technology (AFIT).

- The Air Force encouraged a better understanding between government and industry partners by establishing the AFIT "Education with Industry" program, consisting of one-year, AFIT-sponsored tours at contractor facilities.
- Air Force space pioneers helped encourage national curiosity about what space could do for the military.

1953: Weapon System 117L (WS-117L)

The Air Force initiated WS-117L at Wright-Patterson AFB, Ohio, to assess the potential of space missions. There, a small cadre of space knowledgeable officers postulated a future that included space applications such as reconnaissance, weather monitoring, communications and missile warning. The cadre's work led to new concepts as they probed this strange, unique and different arena. Several satellite programs were eventually developed as part of the Satellite and Missile Observation System (SAMOS) by the SAMOS Project Office. See Chapter 4.

1954: Development of the ICBM

During the early 1950s, the Air Force realized that the intercontinental ballistic missile (ICBM) could be a dominant weapon when tied to nuclear weapons. After a prolonged roles and mission argument, the Air Force was given the task of developing the ICBM. This task supported the development of a space infrastructure in two significant areas:

First, presidential designation of the ICBM program as a matter of national urgency gave the program manager, General Schriever, direct access to the highest levels of government. General Schriever was directed to set up a program in Los Angeles (close to the major / prime aerospace contractors) to "beat the Russians."

Second, development of ICBMs made it easier for the Air Force to adapt big rockets to the role of space boosters. Air Force leadership in U.S. space boosters leap-frogged the Army and Navy because the ICBM funding and priorities were significant.

> "On July 1, 1954, the Air Research Development Command (ARDC) established the Western Development Division (WDD). Under the command of Brig. Gen. Bernard A. Schriever, the new organization settled into a former school building located at 409 East Manchester Road in Inglewood and began its mission of developing the Atlas ICBM. By early 1955, WDD had outgrown its temporary quarters and moved into a four-building complex fronting Arbor Vitae Street near the Los Angeles Airport. … Renamed the Air Force Ballistic Missile Division (AFBMD) on June 1, 1957, the command faced a slowdown in missile development due to military budget cuts."[7]

And then the Soviets launched Sputnik.

1957: Sputnik

The Soviet Union's launch of Sputnik in 1957 sent shock waves throughout the Nation, and especially inside the DoD. A political issue surfaced almost immediately: Which organization would be responsible for handling the U.S. response? In the initial discussions, the Air Force lagged behind both the Army (the Army had launched Explorer, the first U.S. satellite) and the Navy (the Navy launched Vanguard soon after Explorer I).

The table tilted in favor of the Air Force in 1958, when NASA was created to handle civil space activities. The Army's Huntsville rocket team (Von Braun, etc.), the Jet Propulsion Laboratory (JPL) space cadre in Pasadena, and a significant portion of the Navy's space cadre from their research and development groups were transferred to NASA. The transfers weakened the Army and Navy space launch programs, essentially leaving the Air Force as the "last man standing."

1957: Corona

As the Cold War with the Soviet Union intensified, a critical need for access to denied information was recognized at the Presidential level. Needing a backup to the WS-117L reconnaissance programs underway

[7] http://www.globalsecurity.org/wmd/agency/bmo.htm

inside the Air Force, the covert Corona program began under an Air Force-CIA partnership in 1957.

Don Thursby

The Corona satellite initially used only seven real-time binary commands. The H-timer controlled the camera's On/Off cycles. Target locations were based on Kepler's laws of orbital motion, i.e., a spacecraft 90 miles up in polar orbit would circle the Earth in 90 minutes. The initial 7-day (and then 14-day) missions were programmed on IBM punch cards, driven to the "L" Building and taken to the H-Timer Lab. The H-Timer had four spools of 35mm mylar tape (like 35mm camera film but without photographic coating). The time to targets was meticulously square hole punched into the tapes. The H-Timer emulated a player piano; its electrical fingers skimmed the tape's surface. As the timer unrolled the spooled tape and the holes came by, the fingers made contact with the metal surface below sending the camera ON/OFF commands – ON ten seconds before target, OFF ten seconds after. If the Corona/Agena-D was not in perfect circular orbit, vehicle arrival time differentials were accounted for by resetting the H-Timer accordingly over the SCF ground station at Thule, Greenland.

Although there was little valuable intelligence gained from Corona's first successful mission (Discoverer XIV, in August 1960), performance improved steadily. The criticality of the information to be gained from satellite photography was recognized after Discoverer XVIII brought back film of the Soviet Union in December 1960.[8]

> "The film recovered from Discoverer XVIII dispelled all residual concern about a Soviet lead in the deployment of intercontinental missiles and provided the basic hard intelligence around which incoming President John F. Kennedy and his defense secretary constructed their massive overhaul of U.S. defense priorities, goals, structures, and management processes."[9]

Don Thursby

The CIA assigned the code name Corona in 1958. In 1962, we were at VAFB launching Corona payloads every two weeks when we realized how appropriate the name was. Those were the days before transistors and integrated circuits. Internals were controlled by solenoids and switching relays that sparked when they were activated. The solvents and binders

[8] SAMOS returned the first photographs from space, but Corona returned the first photographs of the Soviet Union
[9] Perry, Robert L. The History of Satellite Reconnaissance, Aug 2012. pg. 278

used in the glues, tapes, wiring, etc. never had time to cure or "exhale" (out-gas), so when one of these components sparked, it would cause a flash in the rarefied out-gassing solvents, which would expose the film as it moved through the camera. Even worse, the "rollers" that guided the film into and through the cameras and on into the recovery buckets also created static electricity discharges. This "corona effect" was a big problem – which made the name of the program a perfect choice!

1957: WS-117L Moved to Ballistic Missile Division

The move of the WS-117L space systems development team from Wright-Patterson AFB, Ohio, to Los Angeles achieved many objectives. The first was to create a happy marriage between the space thinking from Wright-Patterson with the launch thinking going on in California. Since most space boosters began life as ICBMs, this was a natural fit. It also allowed program managers to leverage similarities in their strategic missions, and to develop complementary solutions to technological challenges. A security advantage of the new arrangement was that it enabled reconnaissance satellites to hide in plain sight. After Sputnik, space and missile acquisition priorities were very high. This collocation of space vehicles and space boosters was very beneficial to both developments.

1958: The "Missile Gap"[10]

> "The 'missile gap' was the Cold War term used in the U.S. for the perceived superiority of the number and power of the USSR's missiles in comparison with its own. This gap in the ballistic missile arsenals only existed in exaggerated estimates made by the Gaither Committee in 1957 and in United States Air Force (USAF) figures. In 1958 Kennedy was gearing up for his Senate re-election campaign and seized the issue. The Oxford English Dictionary lists the first use of the term 'missile gap' in 14 August 1958 when he stated: 'Our Nation could have afforded, and can afford now, the steps necessary to close the missile gap.'"[11]

[10] http://en.wikipedia.org/wiki/Missile_gap
[11] Christopher A. Preble, "Who Ever Believed in the 'Missile Gap'? John F. Kennedy and the Politics of National Security," in *Presidential Studies Quarterly* 33 (4) (December 2003), 801-826.

One of the key questions was the believability of Khrushchev's claim that the Soviet Union was producing missiles "like sausages." This "big lie" was a tremendous hurdle to overcome, even leading to major disagreements during the Presidential debates of 1960.

Access to information from behind the Iron Curtain was being denied, creating strategic dilemmas that were dangerous to the health of the nation. The shoot-down of Francis Gary Powers' U-2 in May, 1960 made the need for timely photography of strategic rocket forces in the Soviet Union even more severe. Realizing that new technologies could reach beyond the capabilities of strategic balloons and the U-2, President Eisenhower and his National Security Council staff directed the development of reconnaissance satellites.

The Fledgling Air Force Space Cadre

Throughout this tumultuous period, the Air Force missile and space cadre was working hard on programs that would ultimately move them into a leadership position. The Air Force continued to grow its own space expertise, and to establish itself as the principal military service for space. In 1959, "Secretary of Defense Neil McElroy assigned to the Air Force responsibility for the development and operation of all DoD boosters and several space systems."[12] This included the Midas (Missile Defense Alarm System) early warning satellites from ARPA (DoD's Advanced Research Projects Agency). It also included integration of payloads with the boosters, as well as the responsibility for launching them. This was followed in February with the transfer of management responsibility for space-oriented applied research and component development activities. With the new administration of Secretary McNamara, much of this was solidified in the DoD Directive 5160.32:

> Secretary of Defense McNamara's Directive Assigning Space System's Development to the Air Force, 6 March 1961 (DoD Directive 5160.32).[13]
>
> "With the issuance of Department of Defense Directive 5160.32, on 6 March 1961, Secretary of Defense Robert S. McNamara

[12] "Declassified US Government Internal Documents on Military Research and Arming of the Heavens" pg 11. https://archive.org/stream/MilitaryInSpace/Space-319_djvu.txt

[13] Futrell, Robert F. Ideas, Concepts and Doctrine: A History of Basic Thinking in the USAF 1907 – 1964. Air University, 2nd Edition, 1974. Pp 292-95, 386-87.

> assigned to the Air Force research, development, test, and evaluation (RDT&E) of space programs and projects. Under this directive, each military department and DoD agency could "conduct preliminary research to develop new ways of using space technology" as limited by spending levels and other conditions defined by the DDR&E. …. RDT&E of these DoD space programs was assigned to the AF after approval…"
>
> "This directive effectively made the AF the DoD executive agent for all space development programs, regardless of service of ultimate use. It enabled the AF to determine the shape of space developments to best suit its own requirements."

By the summer of 1960, the Air Force had been given the lead role for DoD space, the development of west coast launch facilities (for polar orbits), east coast launch facilities (for navigation and geosynchronous missions), and operations centers around the world for communicating with satellites. This latter support was provided by ARDC's Ballistic Missile Division (BMD), with close coordination and funding support from the Office of the Secretary of the Air Force.

General Schriever, the Director for ICBM development, was very supportive of Air Force space efforts. He worked with the President and NSC during the fall of 1959 and summer of 1960, leading to the designation of a field office in Los Angeles to service the entire Air Force space reconnaissance effort.[14] He supported the President when the decision was made to go with a separate organization located at his Inglewood facility but reporting directly to the highest levels of government. He and Brigadier General Osmond "Ozzie" Ritland, his deputy, supported both Corona and SAMOS (Space and Missile Observation System). This was especially critical in space systems development as there was a direct dependence upon operational support for launch boosters and facilities along with global TT&C (Telemetry, Tracking and Command) sites.

Even as it was becoming the military service responsible for "aerospace," the Air Force was training its early space cadre in all aspects of space operations, while developing the launch vehicles, launch facilities, TT&C

[14] "History of Satellite Reconnaissance," in the *Perry Histories*, 29.

networks and individual satellites. Being on the front lines in this turbulence provided valuable experience for future SAFSP leaders.

In addition, the Air Force was evolving to an aerospace “force” with a focus on technologies necessary to fight the next war. To accomplish this, the Air Force developed the Air Force Institute of Technology (AFIT) program to ensure technological knowledge in its officer corps; it also created both RAND and The Aerospace Corporation, located near BMD headquarters, to provide critical expertise in missiles and space.

Three pioneers who laid the groundwork for the creation of SAFSP deserve special mention: Bill King, Bob Greer, and Lee Battle.

Bill King, SAFSP Pioneer

The early days of Air Force space studies at Wright-Patterson AFB were led by then-Lieutenant Colonel William “Bill” King. He was the driving force behind WS-117L as it grew from early RAND reports into experimentation with payload designs. As “the guy” at Wright-Patterson responsible for the crazy notion of using satellites for reconnaissance, in his own words, Bill got “kicked out of a lot of high-level offices.” He often told stories of many of his escapades “selling space as real!” In the mid-1950s then-Lt Col Bill King's job at Wright-Patterson was to advocate to the Air Force the results of the RAND Corporation study on space, and to build a constituency for an Air Force role in space. As such he and Major Sid Green traveled around the country briefing the potential benefits of space to the Air Force mission. Their briefing at SAC HQ was about to start when unexpectedly, General LeMay and his entourage arrived. They listened first to Sid Green's idea for launching a satellite on a V-2 rocket for the International Geophysical Year (1957) and then to Bill King's presentation on the broader military potential of space reconnaissance, communication, etc. After the presentations were over General LeMay approached Bill and asked, "How did you guys justify your TDY to come here and tell me such crap?"

Gen Schriever’s reaction was quite different. After briefing Schriever, Bill was immediately given orders directing him to report to Gen Schriever on the West Coast.

Bob Greer, SAFSP Pioneer

Major General Robert "Bob" Greer was a respected Air Force officer who had excelled during World War II and in post-war Europe. He had many operational assignments as well as headquarters postings. His assignment before moving to Los Angeles and initiating the SAF SAMOS Project, was to Headquarters U.S. Air Force (in 1957) as Deputy Assistant Chief of Staff (and then Assistant Chief of Staff) for Guided Missiles. Those jobs gave him visibility into the space world and reconnaissance missions – and led to his being selected as the first leader of a "black" program for reconnaissance satellites.

Jack Kulpa

In 1963, I had to go in front of General Greer to try to get a new program approved. After he grilled me for 2 ½ hours, I walked away with $2M (which was a lot of money in those days) and Program P-11.

Lee Battle, SAFSP Pioneer

Colonel Clarence "Lee" Battle moved to the Western Development Division in 1954 and, sometime later, became chief of the systems engineering division under WS-117L. At the time, this included most of the Air Force's space satellite concepts. He continued in that capacity until his appointment in 1958, as director of the Corona / Discoverer program. Corona / Discoverer led to the world's first photographic reconnaissance satellite. His leadership of the Corona System Program Office (SPO) helped create space imaging systems capable of returning information that would become, in President Eisenhower's words, "indispensable to free world security."[15]

With a program office of only three people – then-LtCol (Col/ret) Roy Worthington, then-Maj (Colonel/ret) Frank "Buzz" Buzard and then-Captain (LtCol/ret) William "Bill" Johnson – to help the contractor get the job done, Col Battle and his contractor team had to overcome four daunting challenges, none of which had never been done before:

[15] President Eisenhower's Radio and Television Report to the American People on the Events in Paris (May 25, 1960)

- Design a three-axis stabilized spacecraft
- Allow for orbit adjust burns when the satellite is out of station contact
- Design a film path that would maintain a partial pressure to keep the film from drying out
- Return an object from orbit[16]

Col Battle and his small team were extraordinarily successful, in part because he believed wholeheartedly in a streamlined approach to leadership and management. He captured on a single page his rules to live by. Over time these rules were codified throughout SAFSP. Many leaders who followed him posted "Battle's Laws" on their own wall:[17]

- Keep the program office small and quick reacting at all costs.
- Exercise extreme care in selecting people, then rely heavily on their personal abilities.
- Make the greatest possible use of SSD (Space Systems Division) supporting organizations. You have to make unreasonable demands to make sure of this support.
- Cut out all unnecessary paperwork.
- Control the contractor by personal contact. Each man in the program office has a particular set of contractor contacts.
- Hit all flight and checkout failures hard. A fault uncorrected now will come back to haunt you.
- Rely strongly on contractor technical recommendations, once the program office has performed its function of making sure the contractor has given the problem sufficient effort.
- Don't over communicate with higher headquarters.
- Don't make a Federal case out of it if your fiscal budget seems too low. These matters usually take care of themselves.
- Don't look back, History never repeats itself.

Fittingly, Colonel Battle's advice on outcomes was equally clear-cut:

"Judge results. Let God determine luck or skill."[18]

[16] Day, Dwayne, "Eye in the Sky: The Story of the Corona Spy Satellites," Smithsonian History of Aviation and Spaceflight, 1999.
[17] McDonald Robert A. Corona, Between the Sun and the Earth. ASPRS, Bethesda, 1997, 308.
[18] Conversation with Col Dave Raspet, USAF (Ret.) (December 3, 2012)

Jack Kulpa

The laws Lee Battle set up for running Corona were so good I adopted them for 417L / DMSP.

Lesson Learned from the Early Years

During the parallel development of Corona and WS-117L, the Air Force space cadre and their contractor teams learned the hard way how to conduct space operations. The first twelve Corona flights were failures, but after each one the team assessed what went wrong and tried to fix it. They discovered that space operations would continue to be very difficult, requiring extreme care in development, launch and operations. In “learning by doing,” the pioneers truly understood what it took to accomplish “rocket science.”

CHAPTER 2: THE LIFE AND TIMES OF SAFSP

"In January 1848, James Wilson Marshall discovered gold while constructing a saw mill along the American River northeast of present-day Sacramento. The discovery was reported in the San Francisco newspapers in March but caused little stir as most did not believe the account.

"The spark that ignited the gold rush occurred in May 1848 when Sam Brannan, a storekeeper in Sutter's Creek, brandished a bottle filled with gold dust around San Francisco shouting 'Gold! Gold! Gold from American River!' The residents of the city now had proof of the discovery and the stampede to the gold fields was on. San Francisco's harbor was soon cluttered with derelict ships deserted by their crews. Workers abandoned their jobs - San Francisco's two newspapers were forced to close their doors as their staffs were struck by gold fever. The populations of many of the coastal towns were depleted as prospective prospectors headed to the gold fields."[19]

The early days of Air Force satellite reconnaissance in many ways replicated the excitement, disappointments, and frenzy of the Gold Rush 112 years earlier. The difference this time was that the motivation was existential rather than gold fever. In the history of the United States, there have been only a few times when global threats and apparent peril to the future of America existed to the levels they did in 1958-1962. Thanks to the "Big Lie" promoted by leaders on the other side of the Iron Curtain, the "Soviet Bear" was envisioned to be twelve feet tall, and the need for satellite reconnaissance was driven by nothing less than national survival. This urgency was reflected in the rapid decision-making and organizational setup during the summer of 1960.

1960-1961: The Beginning

The timeline below captures the tumultuous events of the first 14 months of SAFSP's existence, beginning in August, 1960.

August 18, 1960: "Photographs produced…by the first successful Corona flight were impressive beyond hope and generated a surge of enthusiasm which spilled back into the SAMOS Project."[20]

[19] http://www.eyewitnesstohistory.com/californiagoldrush.htm
[20] The Gambit Story, 9.

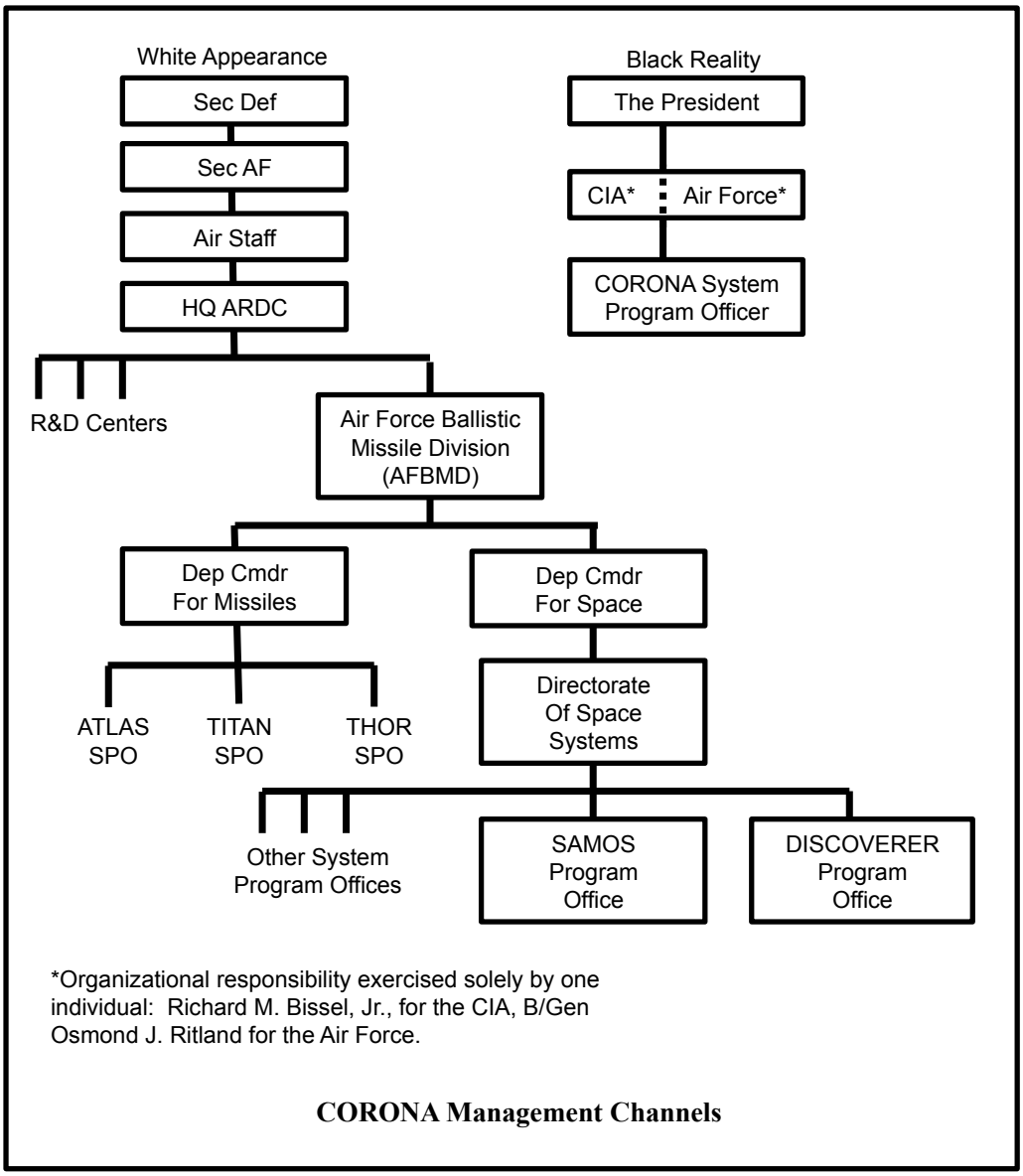
August 25, 1960: A pivotal NSC meeting with President Eisenhower and DoD principals resulted in the initiation of a special organization, a field office in Los Angeles to service the entire Air Force space reconnaissance effort.[21] It would report directly to the Air Force Under Secretary (Joe Charyk at the time), who reported to the Deputy Secretary of Defense. Requiring extreme secrecy and direct access to the highest levels of government, the concept mandated an action office in Los Angeles that was parallel to the ongoing Corona program. In addition, SAF MSS (Missile and Space Systems) was created inside the office of the Secretary of the Air Force as a supporting umbrella organization.

The express purpose of moving the SAMOS Project Office (the action office in Los Angeles) into a compartmented (covert) and separate office was "to accelerate satellite reconnaissance follow-on systems."[22] The new office was patterned after Corona, the ongoing CIA-Air Force satellite reconnaissance program. With no guarantees that one would be more successful than the other, national leadership elected to pursue both programs.

The initial cadre consisted of officers, civilians and enlisted personnel who were already located at the Air Force Ballistic Missile Division (BMD) in Los Angeles, and positions transferred from within the Secretary of the Air Force's office. Some WS-117L projects that were already based in Los Angeles were transferred to the SAMOS Project Office. The Central Intelligence Agency's special acquisition approach and security practices were implemented.

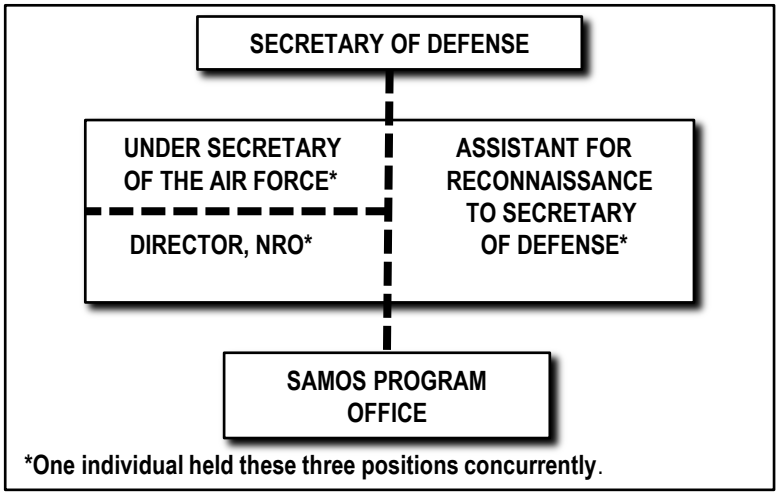
Prior to this decision, the SAMOS project had been under the Air Force Ballistic Missile Division (BMD) in Los Angeles:[23]

[21] "History of Satellite Reconnaissance," in the *Perry Histories*, 29.
[22] The Gambit Story, 112.
[23] The Gambit Story, 9.



Once President Eisenhower's decision was implemented, the SAMOS Project Office moved from the Air Force chain of command into a direct-report line to the Secretary of Defense:[24]

[24] The Gambit Story, 13.



Final SAMOS Organization – 1960

Discoverer (the Air Force scientific satellite program) stayed in BMD where it served as a cover for Corona.

The ongoing Corona program was progressing under different direction and authorization, so it was not to be disturbed during these changes. In his role as BMD Vice Commander, though, General Greer also supported Corona. The CIA purchased and integrated the Itek camera and Kodak film. SP integrated the camera and Agena, launched Corona, tracked it via Sunnyvale, and recovered the film capsules.

The urgency of the national need was to be addressed in four ways:

- First, the priority for reconnaissance satellite system development and support (including facilities for launch, telemetry, tracking and command) would be the highest in the nation – on a par with the development of ICBMs.

- Second, each project director would report directly to the highest levels of government. This provided a direct line of command from the Los Angeles program offices to the Under Secretary of the Air Force, the National Security Council (NSC), and the President. Oversight from normal Air Force procurement offices, as well as the need to brief Air Force leaders who normally managed developmental programs, would be skipped. Bypassing the entire

Air Force chain of command created considerable tension, so much so that at one point SecAF called SP "Charyk's Air Force."[25]

- Third, the programs would go completely "black" and be isolated from almost everyone. This covert approach enabled them to proceed with minimal oversight or bureaucracy.

- Fourth, the projects would use rapid procurement techniques made possible by leveraging the CIA's special acquisition authority.

August 31, 1960: SAF Order #116.1 established the SAMOS Project Office in Los Angeles and provided a direct line of authority from the Director, General Greer, to the Secretary of the Air Force:

- General Greer was named Director of the SAMOS Project with duty station in El Segundo, California.
- The Director would organize an office to manage the SAMOS Project as a field extension of the Office of the Secretary of the Air Force.
- The Director would be responsible to (and report directly to) the Secretary of the Air Force.

Concurrently, Colonel Bill King was named SAMOS Project Office Vice Director, and then-Brigadier General Richard Curtin was named Director of SAF/MSS, predecessor to the SAF (Secretary of the Air Force) Office of Space Systems, the Pentagon-based coordinating office for the NRO.

There is probably no way to tell with certainty as to the specific date when the people in the SAMOS project office began thinking of themselves as belonging to "Special Projects." As satellite reconnaissance grew into multiple programs, it was logical to use a name such as Special Projects to deflect attention from the black aspects of SAMOS. The work that the SAMOS office was doing was fundamentally SP work. Accordingly, the authors propose August 31, 1960, the date SAF Order #116.1 established the SAMOS Project, as the "birth date" for Special Projects. The SAF orders created the organization that conducted "SP" business, with the satellites SP built, and the classification approach SP used. It was fundamentally the beginning of

[25] Conversation with Cargill Hall, NRO Historian

SAFSP although it was known (at the time) by a similar name, Office of Secretary of the Air Force, Office of the SAMOS Project, or SAFSP.

September 1, 1960: The details of the August 25 meeting were released by the Executive Office of the President.[26] After a joint presentation by the DoD and the President's Office of Science and Technology related to reconnaissance satellite programs, specifically SAMOS, a very detailed set of specifics was passed down to the new organizational program and its supporting organizations. This included a development plan with experimental launches and proposed streamline management structure for SAMOS.

The President approved the following recommendations:[27]

- Air Force satellite reconnaissance projects would be assembled into a high-priority program to include the following:
  - A recoverable satellite payload for high-resolution convergent stereo photography
  - Recovered at sea
  - Recovered on land as soon as possible
  - A camera able to identify with certainty specific missile sites both in construction and upon completion
  - Carry other types of cameras to study state of readiness, type of activity and type of missiles.
- Emphasis would be placed on more advanced systems with land recovery
- Electronic readout systems would be given lower priority but be continued as research programs.
- Ferret-type programs would be given lower priority than photography
- "That this program be managed with the directness that the Air Force has used on occasion, with great success, for projects of overwhelming priority. This can best be accomplished by a direct line of command from the Secretary of the Air Force to the general officer in operational charge of the whole program, with appropriate boards of scientific advisors to both the secretarial level and to the operational level. The general officer in command would look to

[26] "History of Satellite Reconnaissance," in the *Perry Histories*, 552.
[27] "History of Satellite Reconnaissance," in the *Perry Histories*, 552.

associated military boards for support in the execution of his plans."[28]

- U-2 / Corona film processing would be used for this program.
- This program would be closely associated with the weather program (TIROS).
- The first experimental SAMOS launch would be in September 1960.

September 13, 1960: The Office of the Secretary of the Air Force made General Greer's assignment public.[29]

September 15, 1960: The new SAMOS Project Office officially came into being. The Air Force Secretary's office, "from its own resources, authorized 10 officers and 10 civilians for General Greer's group while BMD transferred 39 officers and 15 civilians to Greer's new…organization [in Los Angeles]."[30] In a letter to all organizations in the Air Force, Colonel Robert R. Rowland (Secretary of the Air Force Staff) directed other organizations in the Air Force to support General Greer as needed:

> "The high national importance accorded the SAMOS Project requires complete support and immediate response from all elements of the Air Force. All individuals and organizations of the Air Force are urged to provide the necessary resources and assistance to these offices to assure the timely attainment of missile and satellite objectives."[31]

This new endeavor required the best from SAMOS leadership and significant contributions from each program office, its contractors, launch suppliers, global network coordinators and national leadership. SAMOS proceeded rapidly along multiple paths, and both SAMOS and Corona progressed with successes as well as failures. "Keeping multiple balls in the air – all at the same time" was true many times over. The national team was simultaneously pushing critical, embryonic, and seemingly impossible technologies.

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[28] "History of Satellite Reconnaissance," in the *Perry Histories*, 553.
[29] *SAMOS Program Progress Report, Attachment 1* (Month ending September 30, 1960). http://www.nro.gov/foia/declass/WS117L_Records/298.PDF
[30] "History of Satellite Reconnaissance," in the *Perry* Histories, Volume IIa, History, 87, 88.
[31] *Critical to U.S. Security: The Gambit and Hexagon Satellite Reconnaissance Systems Compendium*, 162.

- Design cameras that could be carried on a satellite traveling at an orbital velocity of 17,000 mph, and be able to focus on objects on Earth traveling at a relative ground speed of four miles per second
- Operate payloads that had to endure severe thermal cycles – from brutally hot to extremely cold and back again – 14 times every day
- Modify existing ICBMs (intercontinental ballistic missiles) that could be used as boosters for delivering massive payloads to orbit
- Build launch pads for rockets using new, powerful fuels
- Enable communications for controlling satellites around the world
- And, not the least difficult, catch a deorbiting film return capsule ("bucket") suspended from a parachute over the ocean.

September 20, 1960: Air Force Under Secretary Dr. Joseph V. Charyk directed that Air Force participation in Corona should be handled within the SAMOS management structure. Colonel Paul Worthman, Corona Program Director, would continue exercising virtually all-inclusive authority in Corona with no real Air Force chain of command either above or below him.[32]

> "Dr. Charyk reported directly to the Secretary of Defense in matters affecting SAMOS. One of his first actions, in an organizational sense, was to provide for the administrative reunion of the Air Force portion of Corona with the balance of the original SAMOS project. The resulting arrangement was more nearly a loose liaison than a structural integration, however."[33]

> "The program taken over by Charyk in September 1960, though faulty in some of its technology, nonetheless encompassed a span of satellite reconnaissance vehicles theoretically capable of satisfying every general requirement yet stated, from broad search through relatively high resolution surveillance. With the quiet reinstatement of the Argon mapping satellite, a refinement of the advance film return system, and clandestine approval of the Gambit program, the spectrum was extended to include every technically feasible photographic device that could be employed usefully from orbit. The total program included two different recovery techniques and one near-real-time readout method, a set

[32] "History of Satellite Reconnaissance," in the *Perry Histories*, *Volume IIa History*, 134.
[33] "History of Satellite Reconnaissance," in the *Perry Histories*, 29.

of options which appeared to cover all foreseeable contingencies."[34]

"The matter of how greatly Colonel King's (SAMOS Program Manager starting in 1959) views influenced Under Secretary Charyk cannot be entirely resolved. Surviving documents clearly indicate, however, that Colonel King was well ahead of his contemporaries in urging …termination (or complete reduction) of the readout program, creation of a new recoverable-capsule photo-satellite, and establishment of 'management by exception' channels for the SAMOS program. His recommendations met with a tepid reception in BMD headquarters, a cool response in ARDC headquarters, and icy blasts from most of the Air Staff (The Assistant Chief of Staff, Intelligence, considered King's views on readout and Corona indicative of disloyalty to the Air Force, which suggested both the intensity of the SAMOS controversy and the objectivity displayed by some participants.)."[35]

"The relationship between the clandestine Corona effort and the part-concealed, part-clandestine activity being conducted by General Greer's establishment remained somewhat uncertain, even though on 20 September l960, Charyk had directed that Air Force participation in Corona should be handled within the SAMOS management structure."[36]

December 15, 1960: SAF Order #116.2 directed the Air Force Satellite Photographic Processing Facility to report to the "Director of the SAMOS Project."

January 10, 1961: President-elect Kennedy's "Ad Hoc Committee on Space" reported out that the U.S. was lagging behind the Soviet Union in missile and space technology.

March 6, 1961: The new Secretary of Defense (Robert McNamara) released a far-reaching Defense Directive (No. 5160.32), "Development of Space Systems," summarized below:

[34] "History of Satellite Reconnaissance," in the *Perry Histories*, 31.
[35] "History of Space Reconnaissance," Volume 2a, 99.
[36] History of Space Reconnaissance, Volume 2a, 134.

- The Air Force was assigned responsibility for development and acquisition of all future U.S. military space systems.
- All military services could conduct basic research on space technologies.
- Future systems would be given to the Air Force for implementation.
- The Air Force was given responsibility for R&D and operations of all future DoD imaging reconnaissance systems.
- The Navy would keep the Transit Navigation System.

SecDef McNamara had retained Joe Charyk, a Republican, as Air Force Under Secretary because the two had worked together previously. Charyk proposed turning his space and missiles office into the NRO, which would bring all overhead systems under one roof. McNamara issued his directive after a CIA official signed off on the NRO charter. Not long after that, the CIA began a campaign to get out from under NRO funding and close the NRO.[37]

As a result of 5160.32, the Air Force was responsible for launch boosters and facilities, TT&C networks, missile launch warning, space track and space R&D. Air Force elements supported Army communications and Navy navigation satellites as well. The Air Force became an integral supporter of all DoD reconnaissance satellite programs, although outside their chain of command, through its launch and TT&C facilities. This directive would remain in force until 1970.

1961-1962: Special Projects Joins the NRO

September 6, 1961: The DoD and CIA established the NRO to include…"all U.S. reconnaissance satellite programs and overflight projects…in [the] newly established National Reconnaissance Program (NRP). SAF/MSS [predecessor of SAFSS] and SAFSP became the NRO, whose charter was to manage the NRP."[38]

President Eisenhower and his NSC advisors required electronic and photographic intelligence from behind the Iron Curtain. Meeting this requirement was particularly difficult to "birth" inside the Defense and Intelligence Communities because of the need for absolute secrecy. In

[37] McNamara directive that sets up the NRP with the NRO as its manager.
[38] *NRO Authorities 1960-1965 (U)*, 4.

response, a letter authored by DCI Allen Dulles created the National Reconnaissance Program (NRP). This memo – the initial document for a formal NRP – brought together diverse overhead reconnaissance satellite projects:

- All satellite and overflight reconnaissance programs
- All photographic projects for intelligence, geodesy and mapping
- Electronic signal collection projects for electronic signal and communications intelligence

The memorandum[39] was acknowledged by the deputies who were responsible in the DoD (Deputy Secretary of Defense Roswell Gilpatric) and Intelligence Community (Deputy CIA Director General Charles Cabel) and confirmed a previous agreement dealing with the management and operation of the NRP and the handling of intelligence products on a covert basis. The main points of the agreement were as follows:

- "The NRP will consist of all satellite and overflight reconnaissance projects, whether overt or covert.
- "There will be established on a covert basis a National Reconnaissance Office to manage this program. This office will be under the direction of the Under Secretary of the Air Force and the Deputy Director (Plans) of the CIA acting jointly. It will include a small special staff.
- "Decisions of the NRO will be implemented…within the DoD by the exercise of the authority delegated to the Under Secretary of the Air Force; within the CIA, by the Deputy Director (Plans).
- "Within the DoD, the Department of the Air Force will be the operational agency for management and conduct of the NRO, and will conduct this program through the use of streamlined special management procedures involving direct control from the office of the Secretary of the Air Force to Reconnaissance System Project Directors in the field, without intervening reviews or approvals.
- "A technical advisory group will be established.
- "A uniform security control system will be established for the total program by the NRO.

[39] Perry, Robert L. The History of Satellite Reconnaissance, NRO, 2012. pg. 556-558

- "The NRO will be directly responsive to, and only to, the photographic and electronic signal collection requirements and priorities as established by the U.S. Intelligence Board.
- "The NRO will develop suitable cover plans and public information plans, in conjunction with the Assistant Secretary of Defense (Public Affairs).
- "Management control of the field operations will be exercised directly from the Under Secretary of the Air Force."

November 20, 1961: SAF Order #116.1 (amended) renamed the SAMOS Project Office the "Special Projects Office" and directed it to continue the approaches established by the SAMOS Project Office.[40]

January 26, 1962: SAF Order #116.2 (amended) directed the Air Force Satellite Photographic Processing Facility to report to the "Director of Special Projects."

As NRO missions became more structured in the early 1960's, and as the challenges became more diverse, NRO leadership reorganized into three programs conducted by three major organizations. SAFSP was to be called Program A, with the CIA organized around the name Program B, while the Navy conducted business inside the NRO as Program C. Shortly thereafter, a Program D consolidated airborne reconnaissance programs.

July 19, 1962: SAF Order #116.1 (amended) established the Air Force Element inside the NRO as the mission element called (for security purposes) Program A, and appointed General Greer as Director of SAF Special Projects.[41]

July 23, 1962: The NRO added Programs B and C (the NRO added Program D in January, 1963).[42]

1962-1992: 30 Years of SAFSP Operations

During the 32 years that SAFSP operated in Los Angeles, SAFSP advanced the art of satellite reconnaissance at all levels. The

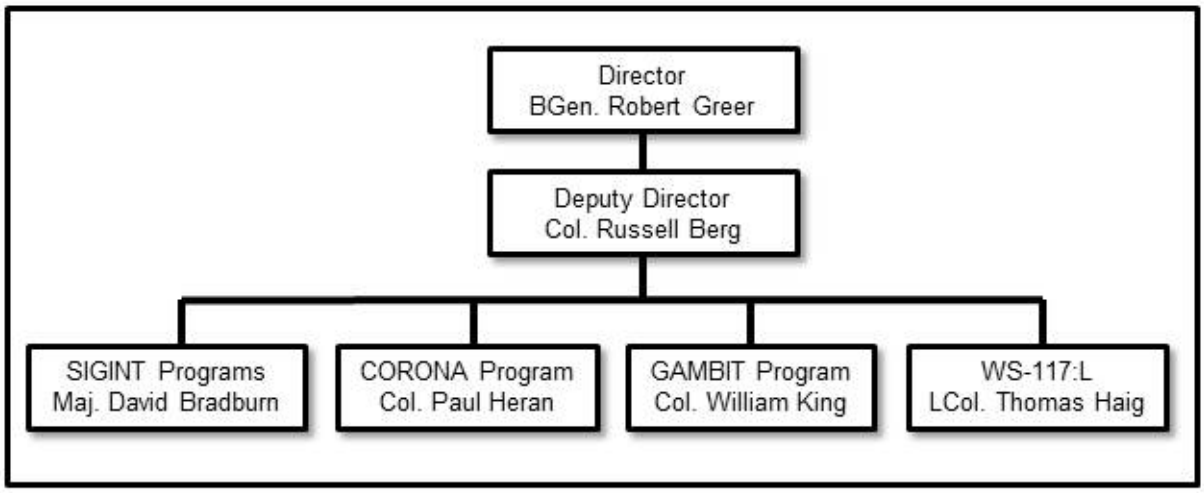
[40] *Chronology of Selected Satellite Systems and Some Management Aspects* (NRO), 5.
[41] Superseding August 31, 1960 SAF Order #116.1 and November 20, 1961 SAF Order #116.1.
[42] *NRO Authorities 1960-1965* (U), 4.

organization worked a project from its core research through the development of key elements, right up through program approval, development and execution. This also included launch, operations and deorbit. Many of these programs were replaced with more capable systems as original technologies were phased out.

Steve Soukup

A 1963 tussle between DNRO Brockway McMillan and DCI John McCone over evolution vs. revolution highlights the measured and conservative approach to things that SP took over the years. Always forward-looking and ready to push the technology envelope, but also always seeking a sound path to ensure that performance could be delivered as promised.

Over this time period, electronic intelligence (ELINT) and photoreconnaissance evolved to become important sources of intelligence worldwide for the highest levels of government and the DoD. This new organization settled out, in 1963, as the next figure[43] shows.



SAFSP Organization in 1963

[43] The Gambit Story, pg. 37.

This led to continuing improvements in all aspects of space operations:

- Buildup of satellite capability,
- Replacement of ICBMs with more capable launch vehicles designed as space boosters,
- Improved launch facilities at Vandenberg and Cape Canaveral,
- More efficient satellite operations (with Sunnyvale operations centers and overseas sites),
- Refined mission, management style, and processes,
- System improvements and refinement with phenomenal capabilities in overhead technologies,
- Growing numbers of personnel throughout the Air Force who were space-smart, thanks to the Directors, Deputy Directors, officers, enlisted and civilians who worked in and with SAFSP, many of whom remained inside the NRO for the majority of their careers.

1992-1998: The End: NRO Consolidation

Whether in Los Angeles or at NRO facilities in Northern Virginia, SAFSP provided full-service support to its members' careers, promotions, assignments, training, education, departures and retirements. The Program A cover related to reconnaissance satellite missions and support to national level-users as well as the DoD; however, no one was assigned to "Program A." Because of the high priority SAFSP enjoyed, no one was arbitrarily assigned to the organization. All personnel were name-requested, which allowed SAFSP to ensure that the right people were placed in the right System Program Office or support organization.

November 1992: The "fact of" the existence of the NRO was announced and its missions were declassified. At first, only the Director, Deputy Director, and (Director of the) Military Support Staff were acknowledged. Other personnel followed over the years. Deployed operational NRO centers and two launch ranges continued to support the SPOs.

December 31, 1992: Programs A, B and C were disestablished.

January 1, 1993: The NRO changed its organization from an A-B-C structure to separate directorates for imagery and electronic intelligence; communications and technology; systems engineering; plans and

analysis; and the Office of Space Launch. This reorganization centralized missions and people on the East Coast, eventually leading to an NRO facility in Chantilly in Northern Virginia (Westfields).

November 1998: SAFSP was disestablished as a unit in the NRO. SP activities were absorbed by the parent NRO, and the people, programs and knowledge transitioned to other critical national missions.

CHAPTER 3: SAFSP PROGRAM MANAGEMENT

Chapter 3 addresses 1) keys to SAFSP's way-outside-the-box approach to program management, and 2) the organization's structure for the 32 years of its existence.

Keys to Success[44]

- Strong dedication to mission
- Empowerment at all levels
- Reporting by exception

Strong Dedication to Mission

The need for strategic reconnaissance over denied territory was urgent. Fortunately, the urgency enabled sufficient and timely funding. All DoD and CIA elements were directed to provide full support to the program. Projects (called Program Offices today) would report directly to the "highest authority" without any intervening management structure. Program Offices would be kept small in order to leverage excellent people to achieve surprising results. An extremely restrictive security environment was imposed on all offices. Finally, and very significantly, tremendous support from the highest levels of the Executive and Legislative Branches of the Federal Government enabled individuals and program offices to focus on the mission and operate with few distractions.

Don Hard

Mission was paramount to Nate (MajGen Lindsay) – when selected to go to Air War College, he turned it down. When asked about that by then-DNRO and SecAF Dr. Mark, he simply stated he would not go because he was convinced he would be of most value to the Air Force doing "meaningful work." As you might expect, Dr. Mark was a little surprised, perhaps chagrined, but Nate didn't go to AWC – and, obviously, went on to more meaningful jobs.

[44] Conversation with Col Dave Raspet, USAF (Ret.)

Jack Kulpa

The opportunity to leverage the unique management approach used by SAFSP is not an everyday occurrence. It occurs only when the Nation's leadership recognizes an urgent national need.

Within SAFSP, the mission drove a continuous search for ways to do business faster and better (which, incidentally, actually made it possible, in many respects, to be cheaper as well):

- More responsive to new requirements
- Streamlined management in every aspect of development
- Shorter turnaround times
- Using the fewest assets needed to do the job
- Centralized control at the Program Manager level
- Solution-focused: see a problem and solve it. Blaming individuals was recognized as a deterrent rather than a solution to identifying and fixing a problem.
- Not "helped" to death
- Reliance on hand-picked, highly motivated and dedicated people in industry, The Aerospace Corporation, and SAFSP
- Working "under the radar" to bring systems into operation without drawing attention
- Lower cost where possible – not as apparent today, but the reduced management burden and direct ties to programs being developed by extremely capable contractors reduced budget requirements[45]

Don Thursby

When I took over the program in 1981, the first question I asked was why we were even trying to launch during hurricane season (July to December). I was told we had to launch before the program's current year funding ran out on September 30. I asked our Aerospace Corporation support to scour the Cape's weather history back to its beginning and find when the weather is most likely to be clear, no clouds, no rain, quiescent winds – and absolutely never a hurricane three months on either side of "the" date. Then we had to figure out how to target all future launches for March 18.

As anyone who has been there knows, hurricanes at the Cape are no laughing matter (unless perhaps 36 years later). Steve Soukup recalls

[45] Conversation with MajGen/ret Jack Kulpa, USAF (Ret.)

vividly how a hurricane can be the ultimate litmus test of dedication to mission:

Steve Soukup

In late 1979 we had a brand new SP spacecraft on top of a Titan IIIC at the Cape being prepared for launch. As luck would have it, the launch campaign took place smack in the middle of 'hurricane season,' and sure enough, a 'cane' formed up in the Caribbean and headed straight for Cape Canaveral. The folks at the Cape had rehearsed this possibility for years and knew exactly how to secure their facilities and the rocket on which our precious satellite sat. Unfortunately, none of us SP folks had given much thought to what you do with a VERY expensive satellite about to encounter a hurricane packing 125 mph winds. Major Jim Mannen, the SP launch campaign manager, quickly took command of the situation, coordinating the work of the SP team, the contractor and Test Group personnel to work out plans to ensure the safety of the personnel and the satellite. We identified an '11th hour crew' consisting of Mannen, Captain Steve Soukup, Captain George Breshears, Captain Barry Priddy, Lieutenant Mike Dunn and Dr. Paul E. Wilson (PEW) from Aerospace Corporation. It was our job to wait as late as possible to ensure that everything possible was done to secure and protect our satellite. We'd been told some pretty scary stories about 'surge tides' that could wash over Cocoa Beach, isolating us from the mainland, so having a well thought-out escape plan sounded like a pretty good idea. Mike Dunn got the assignment of putting that together. Anticipating the worst, we gave Mike a handful of cash and sent him to town to procure a 'survival kit.'

We started securing the satellite in the early morning hours of 1 September. The work proceeded remarkably well through the day and into the night. When we called it quits about midnight Hurricane David was still 36 hours away and we were on track to complete our work and evacuate the next afternoon. However, when we formed up on the morning of 2 September, Dr. PEW told us that he had a concern. The lower half of the rocket would be exposed to the winds and the whole thing could bend and sway violently in the wind during the hurricane's passing – perhaps enough to cause structural damage that could jeopardize the launch. A way had to be found to measure the rocket's motion while the storm was raging around it!

While Dr. PEW and I were trying to conjure up a 'missile motion sensor,' Lt. Mike reported in with the survival kit he'd assembled. He'd found candles, flashlights, batteries, duct tape, and even a couple of Playboy magazines. Unfortunately, he'd forgotten to get any food, so we sent Mike back to town – more cash in hand – to get the goods.

Meanwhile, Dr. PEW had a brainstorm involving four pieces of fishing line tied to the top of the rocket and passing through the jaws of four clothespins taped to the deck of the missile service tower. As the rocket swayed in the wind, it would pull the fishing line through the jaws of the clothespins, and the resulting slack in the lines would be a measure of the rocket's motion. Brilliant! But installing this on the Titan wasn't without its moments. The top of the rocket was over 120 feet above the pad deck, and I drew the short straw for attaching the fishing lines to the rocket. With George Breshears holding me around the waist, and Dr. PEW supervising, I leaned out over the gap, tried not to look down, and taped the lines to the top of the Titan. That was the first and last time I welcomed a hug from Big George.

By the time we were done and ready to split, it was after midnight on 2 September. It was getting pretty nasty outside, and we were ready to go. Mannen had made arrangements to stay behind in the Range Control Center (someone had to see how high the water level would rise) but the rest of us were ready to beat feet for Orlando. When someone asked Mike Dunn what kind of food he had been able to get, he admitted that all he had been able to find in the cleaned-out Cocoa Beach markets was half a case of Spam. So, for the next several days we lived on Spam – cold, roasted, baked, fried – but mainly cold!

Hurricane David hit Florida right at Cape Canaveral the night of 3 September. We were either very good or very lucky. When we were able to get back on the launch pad early on 5 September, our satellite and rocket were just fine. The pad and MST (mobile service tower) had suffered some minor damage, but all in all, damage at the Cape wasn't too serious.

My lasting impression of this entire episode occurred that morning. Jim, George, Barry, Mike and I were the first to climb the stairs of the MST to check out the situation. It was just before dawn but it was already hot and humid, and, without any electricity, very, very quiet. We knew why we had to be there – it was our rocket and our satellite. However, we didn't expect anyone else to rush back to the Cape or to Complex 40. Then they began to arrive. One by one, pairs of headlights winding down the road to the Complex – Martin-Marietta, Chemical Systems Division, McDonnell-Douglas, Aerojet, Aerospace and other folks started showing up. Why? Not because they had to be there, but because they wanted to see if there was anything they or their companies could do to help. That was when I really understood what it meant to be a part of the SP family.

Oh, yes, the missile motion sensor system worked just fine. The deflections were small, the rocket was undamaged, and our satellite was launched successfully on October 1.[46]

SAFSP kept its focus sharp by keeping its size small. Bureaucratic obstacles and outside distractions were minimized as much as possible. Blanket purchase agreements with lodging and car rental companies reduced bureaucracy and reinforced security cover. Travel arrangements were streamlined with the Scheduled Airlines Ticket Office (SATO) and blanket travel orders were issued to each individual.

For launch and other generic development and operational activities, SP relied heavily upon the Air Force space acquisition organization, currently called Space and Missile Systems Center (SMC), as well as Air Force Plant Representative Offices and Defense Contract Audit Agency offices at contractor facilities. Collocated with SP at Los Angeles Air Force Station (later Los Angeles AFB),[47] SMC and its predecessors provided launch, on-orbit support (TT&C), aerial recovery of film-based IMINT systems, and coordination with other Air Force and NASA organizations.

Larry Gooch

In the procurement of the rest of the Atlas-Hs, the expedient SP procurement process was to go through NASA-Lewis and leverage their technical experience on Atlas as they closed out their Atlas SPO.

On-orbit and recovery support was provided by the Air Force Satellite Control Facility at Sunnyvale, California, and its network of ground stations worldwide. Aerial recovery support was provided by the 6593rd Test Squadron and 6594th Test Group at Hickam AFB in Hawaii – which came to be known as the "Catch a Falling Star" unit.

While keeping its size small, SAFSP's responsibilities were enormous. For the early programs, SP was the government's sole program integrator. No armada of supporting cheerleaders. The burden was solely on SP, which in the long run probably helped enable less than four-year development cycles for Corona, Hexagon and Gambit.

[46] Steve Soukup recollection

[47] Previous names for SMC include Ballistic Missile Division (BMD), Space Systems Division (SSD), Space and Missile Systems Organization (SAMSO), and Space Division (SD).

Don Thursby

Across programs, there was always the daunting decision whether to kill a wounded bird in order to launch the new one. When my turn came, my sales pitch was simply to "minimize our maximum regret," the maximum regret being killing the old vehicle and then having a launch disaster. At the time this notion was a hard Community sell, but Gen. Kulpa stuck by me which I truly appreciated. Shortly thereafter another program manager made the opposite decision and lost! Our old bird remained useful, transferred to another MGS and lasted several more years.

The ability to leverage other organizations' resources and investments in embryonic launch facilities and operations centers was one of the key enabling characteristics of this new approach to management: If someone else could provide the support, far better to let them. SAFSP's job was hard enough.

Bob McKean

In 1973, I was a captain in the 6595 Space Test Group at Vandenberg (SLC-4) serving as a launch controller. Outsiders were doing things in and around the launch pads during Titan III propellant operations, including hazardous gas venting (no scrubbers in those days). When I asked who authorized them, I was told one of the Captains in building 7000. I called him, asked why he didn't coordinate with the launch controller team in charge of overall operations at the pad, and he replied that I wasn't cleared for the project. Sporadic events like this continued.

One day, the group commander, Col. Cherry visited the pad and happened to drop by my office. I told him of the incidents and reminded him that we pad rats (and he) were responsible for assuring overall safety during prelaunch and launch activities but I had been told I had no say in these strange activities for which I hadn't been cleared. He seemed surprised but also concerned. It wasn't long (days, I think) when Col. Cherry's secretary called me and said to report to the colonel's office immediately. Of course, I drove right up there, was greeted by one of the security folks, and escorted to the small secure room behind multiple locks. I had been in this room a number of times including when I was first briefed on Gambit and Hexagon. I walked in to find Col. Cherry and another colonel I did not know. I was introduced to this colonel, who was Jake (then-Colonel Ralph Jacobson), at the time the head of SP-6. Amazing – a full Colonel from SAFSP personally came down to Vandenberg to brief me on this special project and the activities occurring at the pad. He made it very clear that

safety was going to be practiced by all, including these "outside" folks in and around SLC-4. He told me these folks must coordinate with me during future endeavors involving pad access, etc. I was given a few phone numbers of offsite people to contact as well. No more venting gas on innocents after that.

Empowerment at All Levels

Tom Haig

On one of my periodic briefings to Dr. Charyk, he said, "Is there any possibility that you can provide cloud cover pictures over Cuba to the people down at Homestead?"

"I'll be back in about half an hour and give you the answer."

I called my guys and a friend of mine who had an antenna we could use. The guys commandeered a C-130 to fly the van to Homestead, and stopped at Radio Shack for the wiring. When I went back into Charyk, I said, "We'll have the station and the equipment there by noon tomorrow, and by the next morning we should be able to supply the weather station with images over Cuba."

Charyk said, "Okay, do it."

"Sir, it's already done."

The latitude each and every member of SAFSP had in how they went about their jobs was simply unheard of inside the government. Streamlined procurement procedures, flexible work hours and schedules, broad credit card authority, minimal supervision, and the ability to tailor individual appearance to the job requirements were all at the discretion of the individual. Within the "Hollywood Air Force,"[48] it was well known that "the place to be" was SAFSP.

Rick Larned

The top four reasons someone from the "outside" wanted to come to SP – without any knowledge of what SP did:

[48] A not-so-well-intended nickname given to the personnel at Los Angeles AFS.

- *A mysterious conversation with a complete stranger, asking whether they would like to work on a cool project.*
- *Knowledge leaked "across the street" about an outfit that hired only the best of the best.*
- *Friends across the hall suddenly moved across the street. The next time they cross paths, they radiate excitement but can't say why, only that "everyone counted for what they did, not what they wore" (no rank and no uniforms)*
- *Friends in SP spoke only in vague, general terms about the incredible responsibility they had, AND the authority that went along with it. Exactly what had been taught at the Academies, ROTC and OTS as the way things should work.*

Regrettably, the "controlled OER" era ("Why should I come to SP and get 2's or 3's until I come into the primary zone, when I can be getting 1's in the real Air Force?") affected all hand-picked organizations.

There was a price to pay of course. Long hours, extended absences from home, a complete wall of silence between you and your family about what you did at "the office," difficult technical problems to solve, and frequent launch failures, just to name a few.

Rick Larned

While promotion rates for SAFSP were consistently high, the absolute requirement for covertness occasionally backfired. Gainey Best was a case in point. Gainey was working closely with Perkin-Elmer on one of our most closely guarded programs. When we were unable to describe to his promotion board what he did, he was passed over. At General Jake's request, a special promotion board, with only program-cleared personnel on it, was convened by the Air Force. Gainey met the Board with rewritten, classified OERs, and he was promoted.

Empowerment was enabled by extremely careful recruitment, training and retention throughout SAFSP. Special arrangements for hand selection of qualified personnel were made through a "Green Door" arrangement at the Air Force Military Personnel Center (AFMPC).

Tom Haig

I didn't want people who had all good reports or all bad reports. I wanted people who had mixed reports because those are the people who can think for themselves.

Program Directors hired their own people. There was no central hiring office before 1989. In the technical domain, those who had proven themselves in one of the support organizations could be name-requested for a SPO assignment.

John Gross

In the 1960s and 1970s, new hires usually came from other organizations where they were already cleared for SP programs. That meant STC (Sunnyvale), Vandenberg AFB, the Launch Vehicle SPO at SMC, or Plant Representatives in the then-Air Force Contract Management Division (now DCMC). In the 1980s, as SP programs required more and more people, accessions began to come in without previous knowledge of SP programs.

Others, usually captains with previous Air Force experience, could be brought into SP-6, the R&D shop. If they did well, they were transferred to a SPO and given responsibility for a subsystem, and after that, a small payload, second stage or equivalent responsibility. Along the way they might be assigned to an operational location to broaden their experience base, then brought back to a SPO where they would be given increased responsibility before finally being made a Program Manager.

Stephen Gourley

There were others who didn't follow this prescribed path, but were brought into a program office directly and given responsibility for a payload immediately, albeit on one of the older programs. Very rarely was someone accepted earlier than a captain. Then-Lieutenants (Col/ret.) Mike Dunn, (MajGen/ret.) Neil McCasland, (MajGen/ret.) Suzanne Vautrinot and (Spectrum-Astro founder) Dave Thompson were a few of these notable exceptions.

The results paid off as SAFSP worked hand in glove with The Aerospace Corporation and industry engineers, scientists, security and contracting personnel to build and fly satellites that Buck Rogers never dreamt of.

Tom Haig

When we were dissatisfied with Scout, the Thor IRBMs were being returned from England, Italy, and Turkey to the Air Materiel Command depot. I called the depot commander and put a hold on all Thors for Program 417, then negotiated with McDonnell-Douglas for their refurbishment. Their initial proposal was about $850,000 apiece. I had negotiated them down to just below $500,000. General Greer called me to his office, where he said

he had just received a call from the head of the company, threatening to withdraw their proposal if I didn't agree to at least $650,000. As General Greer directed, I agreed to their figure. We saw the need for a new second stage for our booster, so we prepared an RFP and sent it out. The part of SP in charge of boosters complained to Gen. Greer, and I was directed to turn the procurement over to that SP division.

Proposals were received from Lockheed and Boeing, and a source selection committee was appointed in SP. After a month or so, the colonel in charge made the mistake of telling Gen. Greer the committee could not decide whether either contractor would do. A very upset Gen. Greer turned the whole thing over to Russ Berg, who came back to me and said, "What do I do now, Tom?"

Dick Geer and I had already gone over both proposals in great detail and preferred Boeing's. The unit price was projected to be about half that of Lockheed's and Boeing's novel spherical solid stage looked good to us, so we wrote a source selection report for Russ Berg and the contract was awarded to Boeing for Burner II.[49]

Today, of course, that drive for excellence is an integral part of special activities throughout the DoD. The development of stealth aircraft and remotely piloted vehicles at Wright-Patterson, the urgency of countering Improvised Explosive Devices (IEDs) in the Persian Gulf, the growing role of cyber operations throughout the Executive Branch, and highly classified Special Ops programs are just a few examples. In many respects, SAFSP was the trailblazer for how future nationally critical programs have been organized, staffed and operated.

Jack Kulpa

I once proposed to General Martin that we form a small committee to fix a problem on 417. His response was direct and immediate: "Don't rely on committees. Nothing ever comes out of them. Don't ask for help because you might get it. Do it yourself."

I never did that again.

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[49] [Burner III was the first solid-fuel upper-stage used for general space applications that had full control and guidance capability. Its general assignment was to place small- and medium size payloads into orbit. The Burner II motor, guidance system and reaction control system were integrated to provide attitude stability and precise control of flight rate and burnout velocity for orbital injection and earth-escape missions. http://en.wikipedia.org/wiki/Burner_%28rocket_stage%29]

Stephen Gourley

In reviewing the performance of our program, I approached Colonel Larry Cress, our SPO Director, about determining the ability of using a novel material to improve the intelligence of my system vehicle (SV). He agreed to my plan and I proceeded. A couple of months later, I returned to brief him on the project. He asked, "Why are you here?" "I promised to return at this point for a decision to implement the change if it was warranted," I said.

"Is it working?"

"Yes."

"Then why are you here?"

I took the hint.

Vern Karlin

When you think of Government Property, you normally don't think of it as a big deal, but in SP we sometimes had some interesting issues. John Brosnan was Chief of Property in the late 1960s and early 1970s—a crusty, "can do" civil servant. As I understand the story, John was told to quickly arrange for a shipment of platinum (valued at about $3M) from an unclassified location to a classified location. Security told him that individuals from the unclassified location could not deliver to the classified location, nor could the individuals from the classified location pick up the material at the unclassified location. Everyone was wringing their hands as to how to make the transfer without compromising security. The story goes that John, on his own, flew to the unclassified location, rented a car, signed for the platinum, put it in the trunk and took off for the classified location, which was more than a day's drive away. When asked about where he stayed overnight, he said he found a motel where he could back the car against the wall of his room and periodically checked his car during the night. He delivered his cargo by noon the next day. I can just imagine the gasps, and the relief that the problem was solved.

Win-Win, Arm's-Length Contracting

An important aspect of empowerment was the ability to have "win-win" contracting with aerospace companies developing the hardware and operations capabilities. From the beginning, the basic approach for development of complex reconnaissance systems included

empowerment of its government team. The assumption was that in response to the stated national need, the contractors would place their best people on these challenging tasks.

This led to some remarkable teamwork between government representatives and contractors. By the late 1970's, the established *modus operandi* for SAFSP was to challenge the contractors with complex needs, trust that they would achieve the results, personally monitor each milestone to ensure progress met expectations, and reward success with good incentive fees (up to 15%, plus award fees based upon performance contracts).

John Gross

Things I remember SAFSP being unique for:

a. Small program offices that did not use integrating contractors. This allowed the Air Force to deal directly with each contractor, get the true picture, and make changes immediately.

b. Tremendous success with performance incentive contracts. Any money lost on schedule or budget could usually be made up with performance that exceeded prior flights. Time on orbit and other performance specifications took off as contractors responded.

c. In the beginning, SAFSP had "white" and "black" contracts with the same contractor. This helped security by providing good cover stories.

d. Good people were recruited by word of mouth and on a by-name basis from organizations in Air Force Systems Command and elsewhere that worked with SAFSP.

e. Decisions were made at the lowest level possible, based upon what is best for the U.S. satellite reconnaissance mission.

This win-win approach to contracting produced remarkable achievements in really short time periods. One key was that the SAFSP lead project officer for a task, subsystem or whole satellite, often showed up unannounced in the contractors' facilities and talked with every level of contractor involved. Each project benefited from this close, personal working relationship because it had the best people working the project from both the government and the contractor.

Mike Umland

I remember my first day on the job – it was two days before the Space Shuttle Challenger disaster. I received my security indoctrination briefing from Kelly Justus in SP-3, then ushered into my new office space in SP-5.

Tom Folkes showed me where my desk was and escorted me to meet Randy Randazzo and General "Jake." I was very impressed that a General Officer would take time out of his very busy schedule to meet with me on my first day. Gen. Jake made it very clear to me that I wasn't just another Staff NCO, but an integral part of the SP family. Then he handed me a sheet of paper and said, "This is your job description." I looked at him quizzically because the paper was blank on both sides. He said, "Do whatever is necessary to get the job done!" He made it crystal clear to me that not only did I have the responsibility of getting the job done, but I had the authority to do it.

Reporting by Exception

Empowerment was the watchword for SAFSP at all levels of the Government. Just as Special Projects members had almost unlimited discretion in how to do their jobs, SP was given special dispensation from higher headquarters in the form of "Special Acquisition Authority." The Secretary of the Air Force granted the SAFSP Director (SP-1) "unlimited authority" to sign "black" contracts without higher level approval. SP-1 did not delegate that authority for the first 20 years of SP's existence. Later, the Vice Director (SP-2) was delegated authority to sign contracts up to $25M, but SP-1 retained authority for all actions above that amount. In 1980, signature authority was granted to the Director of Contracts (SP-9) for "black" contracts up to $50M.

John Pace

In the early 1990's, as we were consolidating NRO activities on the East Coast, there was a lot of energy spent on how authorities (such as contracting) flowed from "higher" organizations historically and how those authorities should flow in the future consolidated NRO. It was like they were questioning our faith. The NRO legal team researched the originating documents and concluded that the NRO was a DoD agency and that SP contracting authority was delegated from the Under Secretary of the Air Force (or Secretary of the Air Force) in his DNRO role and not as an Air Force Secretary. This was subtle but key because in those years the NRO's existence was being acknowledged and "white" Air Force interests (like the Air Force Director of Contracting) were concerned that SAFSP might be using Air Force authorities without Air Force oversight. Can you imagine the impact on the NRO if outsiders thought that SAFSP was a rogue organization (they did) and once declassified they could prove it (they couldn't)?

SP's performance incentives for contractors were also unusual. Major SP contracts included cost, schedule and on-orbit performance incentives that offered the contractors the most fee the Federal Acquisition Regulation (FAR) would allow. This arrangement encouraged them to excel because it included the provision that less then excellent performance would be penalized.[50] By offering more than other Government agencies it was hoped to get the best contractor resources. SP also paid faster than anyone else by using the SAFSP Budget Office (SP-12) as a paying office. These incentives communicated to the lowest levels of a contractor's plant, to the assemblers and testers, the importance of what they were doing.

Maj Gen John L. Martin, Jr, SAFSP Director, July 1965-July 1969, created a contracting incentive structure for major programs that motivated excellent contractor performance by financially rewarding overall on-orbit mission excellence, and by significantly reducing profit for lesser performance. "The Martin Specialized Incentive" was used on Byeman "production" contracts only, from its inception throughout the SAFSP years, and it consistently proved to be very effective. Key elements of the "Martin Specialized Incentive" are described in this notional example:

- 15% fee (maximum fee allowed by FAR)
  3% minimum + 12% maximum incentive fee
- No under run incentive – did not want to encourage contractor to cut costs to increase profits at risk of impacting mission performance
- 12% incentive fee at risk for cost overrun
- All incentive fee at risk for on-orbit performance (double jeopardy)
  Note: "earned" cost incentive had to be earned again
- On-orbit life and performance requirements contractually established
- "Earn back" provision for lost incentive fee for extended life/performance, or for future satellite life/performance on the same contract
- Billing of Fee prior to performance was integral to incentive effectiveness::
  Fixed percentage (7%) of incurred costs until acceptance-

[50] Vern Karlin called it the "Give them the money and let them fall on their keister" approach.

delivery, unless incurring cost overrun, then fee paid was reduced
Upon acceptance/delivery (if no cost overrun)
8% of all costs from inception -15% on costs from then on

- Earned Performance Incentive Determination Process
  Actual earned fee determined monthly by SAFSP
  (after initial on-orbit checkout)
  If contractor met or exceeded performance incentive requirements, contractor kept earned fee for that month
  If contractor did not earn all of allocated fee the contractor had to pay SAFSP back by check – loss could not be offset by reduced future contract billings
- The Payback Provision for less than exemplary performance was key to the success of the Martin incentive:
  "De-booking" of booked profit was painful to contractors, especially to Executive and Senior management and especially when reaching back to de-book prior years' booked profits.
  Ensured contractor commitment and resources necessary for program success, e.g., best people assigned to program.

In 1976, in recognition of a growing interest in cost control, General Kulpa established a panel to review SP's fiscal management with the following direction:

> "SAFSP contracts have historically placed major emphasis on achievement of performance objectives with considerably less emphasis on cost and schedule goals. However, with current Congressional and DoD interest in austere budgets, it is particularly appropriate for SAFSP to consider ways and means of achieving more realistic initial program costs and more effective cost control on existing contracts. The present maturity of some of our major programs may afford us a good opportunity for discovering improved methods of controlling costs. Moreover, we may now be able, on new programs as well as follow-on programs, to increase our emphasis on cost without sacrifice of performance objectives."

Chaired by Vern Karlin, Panel members included Gainey Best, Larry Clark, Don Depree, Mike Foehner, Ross Fulbright, Tim Malishenko, Bob Mitcham, Bill Nicholau, Wayne Schumacher, and Ron Toman. The panel addressed SP overrun history, conventional contract types and techniques, increased cost emphasis, SP "Design to Cost" applications,

pre-award contract improvements, and cost models.

The final report included 36 specific recommendations designed to improve SP's way of doing business. The essence of the study's findings was that SP understands the benefits of various contracting and cost management approaches. The chairman stated:

> "SAFSP has maintained a formidable "team," unexcelled in response or responsibility anywhere in the government. This elite status has been accomplished through creativity, maximum SPO authority, highly qualified and motivated personnel, and management approaches such as the technical/procurement collocation concept. However, progress must be made to accommodate our ever-changing environment."

One particular area of concern, the possible overuse of the Martin Specialized Incentive, was specifically addressed in the DC out-briefing and explained by the Chairman as follows:

> "All contracting approaches are at our disposal. The Martin Specialized Incentive approach serves us well, but we are not enamored with it to a fault. If a different contracting approach were better for a given situation, we would use it."

Stephen Gourley

Incentive fees were paid up front. Should the contractor not perform in an excellent manner, the Fee Determining Official would lower the awarded fee to less than 100%, and the contractor would have to write a check to return the lost fee. Booking the loss against future billings was not acceptable – the Plan called for every level within the company to know they had messed up, an additional, embarrassing incentive. The subsequent loss of money to the program (the check went to the U.S. Treasury, not SP) was considered a cheap price to pay for the performance incentive.

Lance Krieger

Usually half of the fee available could be lost for poor cost and schedule performance, but even if it were earned the fee was still risked on orbit, after launch. After MMD (mean mission duration), lost cost and schedule performance could be earned back for continued on-orbit performance.

In keeping with this special authority, an enabling exception to government oversight was authorized. Only the chair and ranking minority members of four congressional committees were given access to SP programs. The so-called "Gang of Eight" conducted the necessary oversight.[51]

This restricted level of management review carried through to the Executive Branch as well. To ensure rapid execution of developmental programs, a direct line of access to the Secretary of the Air Force was authorized. This eliminated the need to go through the Air Force development and materiel commands or the Air Staff.

For financial and cost accounting, Special Projects had a great deal of latitude in determining how best to work with DoD contract management and cost accounting organizations (the Air Force Plant Representative Offices (AFPROs) belonging to the Air Force Contract Management Division (AFCMD), the Defense Contract Administration Services (DCAS) Offices (DCASOs), and the Defense Contract Audit Agency (DCAA)). All financial management i's were dotted and t's were crossed, and visibility into technological details was restricted to the fewest number of people possible.

The operating methods developed and executed by SAFSP continued from the beginning of the organization until its closure. Interfaces with outside organizations were critical to mission success, with special emphasis on leveraging other organizations' staffing, launch and satellite operations. In many ways, SP's organization reflected the guiding principles of Deputy Secretary of Defense (1969-1971) David Packard's (of Hewlett-Packard fame) tenets for how to run programs:

> "Hire the best people for the job, give them the authority and resources they need, and then get out of their way and let them do it."

[51] Marshall Curtis Erwin, "'Gang of Four' Congressional Intelligence Notifications" (Congressional Research Service, April 16, 2013).

SAFSP Organization – SP-1 to SP-16

SP-1	Director	SP-9	Contracting
SP-2	Vice Director	SP-10	Operations
SP-3	Security / Policy	SP-11	(still classified)
SP-4	Safety	SP-12	Budget
SP-5	Personnel	SP-13	(still classified)
SP-6	R&D	SP-14	Gambit Program
SP-7	Hexagon Program	SP-27	Manned Spaceflight Engineers (MSEs)
SP-8	(still classified)	SP-16	Launch Integration

SAFSP Organization circa 1970's[52]

In organizing Special Projects in the early 1960s, the basic approach was to respond to the urgency of the mission and "push" critical technologies while protecting security.

Ken Caviness

Once when I was working for Jack Kulpa, we were talking and he asked me why the offices had numbers but no titles. I looked into it and found that General Greer had done it because it gave no insight into what we did. It was also simple and, once you were inside the system, easy to remember.

Several programs other than those shown above were successfully developed and operated by SAFSP over the years. Many of these capabilities and their successors are still classified 40 years later, which attests to their significant contributions to National Security. Regrettably, openly acknowledging these remarkable programs – and the SP, Aerospace Corporation and contractor team responsible for each – will have to wait for a sequel to this monograph.

Don Thursby

SP-8, a "basket SPO" with several programs, took up the whole first floor of SSD Building 110. The main hallway was horseshoe-shaped. The head shed was at the top of the horseshoe and the program offices were catacombed along either side. Junior officers could do a full tour in their one-man offices and never be noticed by the seniors. Col Stelling was a sprinter, dashing down the long hallway each morning off to staff meeting. When we heard him coming we would grab any papers on our desk and dart out of our offices up the hallway so that, on passing him, just a "Good

[52] SP also supported a sister organization, SAF / SL, for the Manned Orbiting Laboratory, 1966-1969

Morning!" was recognition and even better, it looked like we were working an urgent problem.

SP-1: Director, SAFSP

The SAFSP Director (SP-1) had a complex responsibility executing programs, taking care of the people, and protecting the organization. During the Greer-Martin-King "pioneer" era, SP-1 was the only person in SP authorized to sign "black" contracts. In addition, each SP-1 was intimately involved in every aspect of every program.

Jack Kulpa

I was the P-11 (P-989 family) program manager when one day General Greer came running in and started to chew me out. P-11 was a small subsat that flew on Gambit-Agena. It carried two motors that were used to change orbits, and I had preempted a Gambit pass for my P-11. General Greer was so involved in the technical details of all our programs that he knew when even one pass was changed.

Ken Caviness

In the early Gambit days, we had a flurry of activity calculating targets for each rev, and then we had nothing to do for 90 minutes waiting for the bird to come around again. General Greer was a mathematician – he taught math at West Point, and wrote a book on how to beat the odds in Vegas – and he got us in the habit of putting a problem on the chalk board during our down time and seeing who could solve it. One day Bill put a geometry problem on the board, and the team went to work, but with no success. When Bill and I went out for coffee, he told me he was so worried about the difficulty the team was having that he had called home and asked his son to read the problem from his 10th grade geometry book, to make sure Bill got it right. It was, and nobody solved it.

Generals Martin and King were the same way, and that extended into the first half of General Kulpa's tenure. At every staff meeting they would discuss in detail the progress and problems of each program, even including factory testing.

Lael Henderson

My favorite anecdote that displays the total involvement of SPO Directors in their SP program has to do with Colonel King when he was the Gambit SPO Director and I was a 1st Lt Launch Controller at SLC 4. The Gambit

follow-on vehicle had a new command system that required all new command software to be generated by the SCF contractor in Sunnyvale.

To prove its compatibility with the vehicle we ran a series of compatibility checks with the Development Test Vehicle on the pad mated to the flight booster. Each time a number of problems occurred that caused the compatibility checks to fail. We ran the checks three different times and after each attempt we conveyed the details of the problems to the SCF and to the SPO in Los Angeles. The same problems occurred every time. The testing was beginning to impact the DTV schedule, which could potentially impact the launch schedule.

One day without warning Colonel King showed up at the pad and looked me up. I was responsible for TT&C testing at the pad. Colonel King had none of his SPO project officers with him and he asked if I had the problems with the command system compatibility tests documented. I told him they were documented in the Launch Controller log book. He told me to get it and that we were going to the Vandenberg Tracking Station. The GE / AESD team chief, Donny Saar, was at the pad and I suggested that he should go with us.

We hopped into Colonel King's government vehicle and went unannounced to the tracking station. As soon as we got there (no visit request had been sent) the guard at the gate called the commander who within minutes was at the gate to escort us in.

We sat down around a long table in a conference room. Colonel King asked to have SCF contractor personnel brought in. After they arrived he turned to me and asked what the first problem was. I read it out of the log. He asked Donny Saar for his perception of what was causing the commands to be rejected and Donny gave him an explanation. He then asked the SCF contractor guys if they could fix the problem. They said they thought they could.

Everyone sat there for what seemed like a long time but it was probably only a few minutes. Finally Colonel King said, 'Then go fix it.'

The Tracking Station Commander just sat at the head of the table shaking and said nothing. The problem was that the SCF contractor folks at Vandenberg were not supposed to do anything without receiving change orders from Sunnyvale. Nevertheless, they left the room and came back in half an hour or so and sat back down, reporting that they felt they had fixed

the problem. Colonel King turned to me and said, 'What was the next problem?'

We went through the same routine and everyone sat there until he said, 'Go fix it.' This went on until we had covered every problem. The next day when we re-ran the compatibility checks they passed with flying colors.

Ken Caviness

Early on, I didn't think Bill King liked me much. One day I got a call from him at 0700 as I was getting ready to go to work. He told me to wear civvies and meet him at the Harbor Golf Course. I told him I would have to tell my boss what I was going to do, but Col King told me not to tell anybody, and we would go into the office at noon. At the golf course, Col King warned me that my boss would threaten to court-martial me for being AWOL. He told me that if my boss had any questions, I was supposed to just say, "Please call Col King."

Sure enough, my boss had delayed his staff meeting because I was late, and he was furious. I did what Col King told me, and my boss disappeared down the hall, leaving the rest of us sitting in the conference room. When he came back and the staff meeting resumed, he told the assembled crowd that I am working a special project for Col King, that we are the only two people cleared for it, and that we can't tell anybody else about it.

Later, when I told Col King what had happened, he replied with a big grin, "Oh, we can work this to the hilt!"

The 1980's had a different feeling to it as the "every detail" responsibility shifted to the SAFSP Deputy Directors (System Program Managers), who briefed the DNRO regularly on the technical and programmatic aspects of their satellites. SP-1s had more on their plate, managing people issues, delivering funding to the program offices, and coordinating with NRO offices on the east coast. General Kulpa summarized the new environment:

Jack Kulpa

Security leaks had started to come out and we had to work those. Our ability to 'cherry pick' good people became a little harder, so we had to spend more time getting the best people for the job. We built a SCIF (secure facility) at the Air Force Military Personnel Center (AFMPC) in Randolph AFB, where I would brief the commander and vice commander every six months on what we were doing and why we needed the people

we were looking for. The environment was changing and SAFSP had to adjust to the times. I remember when a major, new, very-high-priority program was just starting, and I let the Program Director run with it because my plate was just too full.

Mike Hayner

I had been the Civil Engineer at Buckley for five years and Personnel Center was telling me I had to leave and was working an assignment for me in Base CE at Lowry when I was visited by the Deputy CE from AFSC. After seeing what we were doing and had done at Buckley, he asked me if I had ever thought about going to Sunnyvale. I told him I had tried but was told by Personnel Center that would not be a good move. He told me the AFSCN really needed someone with my skills and suggested I call Col Jacobson and let him know I wanted the job. I called Jake and told him I had heard he was in need of a CE and that I was "crazy enough" to want the job even though I had heard it was a thankless one. I had orders within a week and never looked back.

In the new era, SP-1's role had become wide-ranging and multifaceted:

- Communicate regularly with the Director of the NRO
- Coordinate with the other NRO Offices (CIA, Navy and NRO Staff)
- Ensure funding for the SPOs
- Provide a technical interface with Congress, including congressional testimony
- Coordinate with other Air Force organizations (BMD for launch and operational support, the Air Force Military Personnel Center, etc.), and the user community (Presidential offices, National Intelligence agencies, and military forces in the field).
- Satisfy principal customers (intelligence data users)

"Jake" Jacobson

The overriding emphasis within Special Projects was to stay focused on the mission. As General Jake asked at almost every gathering, "How are we doing today on spying on the Russians?"

The resulting role for SP-1 was to lead a dynamic organization with multiple satellite systems being developed, launched and flown. What made the system work was that the SP-1s trusted their Program Directors to run with the ball once the play was called.

Lael Henderson

Although SP-16 played a role in the integration with the booster, the responsibility remained with the SPO Director. I remember when the Titan had a failure and we (SP-8) were to launch next. Jake sent Jim Mannen to do a review of the failure, and Jim recommended that the separation pyros be changed.

I had a separate review done and determined that a tolerance buildup had caused the failure. I convinced Ernie LaPorte (our Aerospace Corporation partner) that our assessment was correct, and that left Jake in a bind.

Jake called me in and we worked out a compromise. We would make sure that the tolerance buildup was not occurring on our booster, and I would allow the switch to the new pyros as I felt that they did not reflect a significant additional risk over the old ones. If I had not agreed, Jake would have gone with what I recommended as the SPO Director.

As General Jake was fond of saying, he was responsible for "program launch date, budget and staffing," and the rest was up to the Program Managers.[53]

From numerous sources

General Jake's attitude toward his program managers was refreshing and wholly typical of the SAFSP ethos: "There they go and I must catch them for I am their leader."

Over the years, SP-1's role expanded as each new program brought with it new customers for reconnaissance products. Initially, the role was coordination with national leadership, primarily the Intelligence Community and White House. As dissemination of intelligence expanded to a wider audience, SP-1 became a principal supplier of critical intelligence to operational DoD organizations as well.

Terry Ramirez

I saw a document signed by the Secretary of Defense and Secretary of the Air Force that gave the SAFSP Director the authority to ignore or deviate from any regulation or directive they deemed incompatible with the SP mission. I looked at Jake and said, "Wow, you're like a god in the Air Force."

[53] Conversation with Col Dave Raspet, USAF (Ret.), former SP-2, during the 2012 SAFSP Legacy Panel.

He looked at me and smiled. "No, it means I'm responsible. I'm responsible for the success, and I'm responsible for every mishap or misfortune that happens."

"How do you sleep at night?"

His smile got bigger. "Because I'm surrounded by the best of the best."

SP-2: Vice Director, SAFSP

Don Hard

When I went to work for Jake as his SP-2, his in-briefing went something like this: "Well you're here because I like what you have done, and I need all the help I can get. You haven't needed much supervision in your last job (AFSCF Commander) and I am not going to give you much for this one. Just go out and do good things. Let me know if I need to be involved." Talk about management by exception!

The job of any "Vice" is necessarily dependent upon the relationship with the boss, and that was especially true for SP-2. The thinly manned "front office" meant that there was more than enough work to keep both busy. An additional manifestation of the lean staffing included the fact that, by design, SP-1 did not request a general's aide.

Ken Caviness (SP-2)

When I was a captain working for Bill King, one of my jobs was to figure out the launch time for each Gambit. The objective was to get the best sun angle at 50° north latitude for that time of year. We used "eta-beta" (η-β) charts provided by Aerospace, which were done in pencil, with the width of the pencil line being about 10 minutes. After I calculated the launch time, I had to clear it with Bill before we could send it out. One time I gave him our optimum launch time of 1100, with a 30 minute margin on either side. He looked at my numbers and told me to change them to 1033, 1103 and 1133. I told him there was no way we could get that kind of precision, to which he replied, "I know, but this sounds more technical."

Several years later, I was talking with Bill Chambers, who had been at Vandenberg for our launches, and he asked me how I was able to figure those times. When I told him what we had done, he looked at me in horror. "We had the same η-β charts that you did, and you don't know how many

hours we spent trying to figure out how you did that. We worked our butts off trying to hit those numbers!"

SP-3: Security / Policy

From the beginning, the demand from the President and the National Security Council was for covert satellite reconnaissance. This meant that the entire organizational arrangement within and among government and contractors must be kept black, with a minimum number of people "in the know." The development of such a culture was not instantaneous, but it evolved throughout a small but expanding community.

SAFSP-3 was established late in 1960 as a small office handling multiple tasks, including security and policy, far beyond the restrictive title of Security. Initial challenges included cover stories for the new activity, starting new programs, and accelerating other activities important to the NRO. Captain Harvey Cohen, newly arrived at BMD in 1960, was invited in as a security police specialist who would handle the distribution of badges and covertly ensure they did not end up outside of the limited community.

Harv Cohen

I was not yet assigned to the SAF SAMOS project when someone in the newly created office suggested that I come over and create "Security Guides." I quickly responded that I would not recommend that action, as it would just create targets for outsiders to investigate. This response favoring logic over procedures opened the door as they invited me into the small club of SP'ers in 1961.

General Greer gave me my first security guidance: "We are not going to have a bunch of security people!" He made it quite clear that 'no nit-picking security types' would be allowed at contractor facilities.

An entirely new national security system had to be created from scratch in order to accomplish this overwhelming challenge. To put this new culture in perspective, the "players" in the new system were everywhere:

- U.S. Government (from the National Security Council to the users of the intelligence, such as the CIA and NSA)
- The complete NRO organization of Air Force, Navy and CIA offices

- Supporting organizations (launch facilities, launch operations, TT&C operations, and BMD support)
- Contractors that included satellite, payload, and launch vehicle builders; operations centers; and transportation organizations

The Air Force had an advantage for covert activities in the early days when everyone was moving to their new assignments and changing organizations. They were moving into the Ballistic Missile Division, a center of activity that was already focused on satellites and launch vehicles. As such, SAFSP personnel hid among the parallel organizations and kept their own mission quiet. They could move among similar projects being developed and quietly go about launching reconnaissance satellites inside the new Air Force space infrastructure.

This monumental challenge of creating a secure culture was to institutionalize security activities across SAFSP. The scope quickly grew from an SP-wide to an NRO-wide, and then to a U.S. Government-wide covert structure that involved Herculean tasks:

- Implement the Byeman Control System (BCS).
- Compartmentalize all aspects of SAFSP's activities so that the fewest people possible knew the details of any single program.
- Require a "Third-Party Byeman Introduction" to ensure that compartmentation was protected and rigorously enforced.
- Use code numbers for satellite programs. Do not use any satellite program names outside of a vault.
- Require initial and regular, comprehensive background investigations and counter-intelligence polygraphs.
- Create new approaches to achieve reasonable processes

Harv Cohen

The SP security culture followed the organizational culture. We tried to maintain an effective working relationship with the contractors as well as with the program offices. Focusing on the mission was more important than monitoring compliance or meting punishment. Security was designed to contribute to the mission, not to inhibit it. Mission success was the watchword of the whole organization. When we found a problem, our approach was first to understand it, and then help them fix it. Not everyone could work within that context. If someone was chronically unable to operate in that domain, we let them go.

Implement the Byeman Control System (BCS)

To set the stage for understanding the organizational culture, SP-3 recognized that it was critically important to mandate the instructions: "Thou shall be Covert!" In the early days, it was extremely important to keep Special Projects activities covert, for at least two reasons.

The more obvious was to keep an adversary from knowing that we were watching what they were doing. Over time, as it gradually became more public that the U.S. was conducting satellite reconnaissance, countermoves by an adversary became the rule rather than the exception.

Another reason for staying covert was to avoid international challenges over the legality of satellite overflight. The U.S. did not want to move the U-2 overflight issue into space. Internationally, it was expeditious to think of the Russians as the ones who flew satellites over other nation's territories without asking permission (Sputnik in October 1957).

In view of the potential ramifications of publicizing the "fact of" satellite reconnaissance, it was agreed at the national level that the existence of the NRO would neither be made public nor acknowledged and, instead, would be held as restricted information. A covert, unacknowledged security structure, the Byeman Control System (BCS), was put in place to control access to the organization and its technical, launch, operational and programmatic details.

Compartmentalize

The goal was to protect all aspects of SAFSP's activities so that the fewest people possible know the details of any single program. Within SAFSP, SP-3 was a "first among equals" office. Each program was run by a separate group of people, in a separate vault, and controlled in a separate security compartment, such that someone in SP-7 would not be cleared into what someone in SP-14 was working on. SP-3 security specialists were involved in each program office.[54] Facilities, contacts,

[54] For its support offices (SP-3, 9 & 12) SP practiced standard "matrix management" – the support staff were embedded in each program office, but their evaluations were signed by the Support Director (3, 9 or 12).

visits, mail, contracts, and messages were all handled as BCS classified information.

One very serious action was to ensure that the concept of optical payloads was separated from any mention of launch vehicles or satellites. The suppliers of cameras for space had to ensure that their company name and activities did not show up during any open discussions on space systems. Obfuscation was the name of the game for much of the early research and development. As all the systems were very large and their movement would attract attention, many unique approaches developed.

Harv Cohen

When the dust settled in the early days at a major supplier of the payload optics hardware, there was a delightful cover story involving Eastman Kodak manufacturing. They were actually making "Hawk-Eye" cameras in the same building where the full-up clean rooms were in operation for the Gambit payload (which even had some very expensive gold tape for thermal control). The covert front of a small camera manufacturing plant worked for many years.

Require a "Third-Party Byeman Introduction"

To ensure that compartmentalization was protected and rigorously enforced, the sharing of information between people was controlled by a "third-party Byeman introduction." It worked as follows: When one person does not know the level of security of another, they must find someone who knows both their levels. Then the third person would introduce the two of them so they have common knowledge of the security levels of each. This had to be done IN PERSON, not over the phone. It worked very well at controlling who knew what and when. A key for its success over so many years was personal rapport vs. rigid security requirements. The basis for the security system was simple: "Individual recognition of the other person's need to know, and current level of access, through person-to-person introduction."

Cathy Swan

I was first briefed into the Byeman Security System in 1976. This put me in a unique position of being "Byeman introduced" to my mother, Jane Wood (SP-12) and my husband, Peter Swan (SP-6). While we often joked at parties when people didn't realize we were related, we never joked about Byeman introductions.

Harv Cohen

Interestingly enough, the word Byeman actually had nothing to do with the third-party introduction. The code word "Byeman" was simply the next one on the page at CIA headquarters when the administrator was asked, "What code word would you like?" Sometimes truth is stranger than fiction.

Use Code Numbers

One topic of discussion in 1963 was the realization that the history of naming large vehicles (airplanes, tanks, ships) had to be avoided in the NRO. That led to a conscious decision to identify all satellite programs with a number, not a name. As SP did not have the authority to declassify NRO systems and launch configurations, we actually induced the Air Force, through the Secretary, to create an Air Force regulation that required the number and make-up of all launch configurations to be classified "confidential." If you were in the know, you could translate number to mission and gain an understanding of the satellite's makeup. While this direction had the added benefit of keeping the press out of the picture, it really upset many Air Force space professionals who thought they should know why the missions were being classified. Corona, for example, masqueraded as Discoverer, a biomedical capsule recovery project. Hidden in plain sight.

Require Background Investigations

The new culture required initial and regular, comprehensive background investigations and counter-intelligence polygraphs. Every officer, enlisted airman or civilian entering the Byeman system had to undergo a thorough background investigation that in the early days could take anywhere from three to six months. So, besides selecting a known entity from a support organizations, one had the advantage of getting someone who already had their background check done and could be put right to work. In addition, each employee voluntarily submitted to regular counter-intelligence polygraphs.

Pursue New Approaches

The development of a security system that was so comprehensive and effective across 40+ years reflects well on SAFSP's management

philosophy. Empowerment was the approach used across the organization, but it was especially true when embedding SP-3 people inside the tremendously hectic system program offices. Throughout the organization everyone realized that there was only one way to keep a "black" organization covert: integrate security into every facet. Another key to the success of the Byeman Control System was the necessity to adapt to circumstances and not depend upon organizational customs. This included many seemingly small steps, but each step contributed to the success of the mission:

- When visiting another facility, no identification of organization or company was allowed.
- Military members were to wear civilian clothes when traveling to or interfacing with contractors.
- Military members were issued blanket travel orders that would allow them to go where and when they deemed necessary for the mission, without revealing sensitive information.
- Information regarding organizations and their relationships was controlled within the Byeman Control System. The Byeman Security System was controlled from inside SP-3's Los Angeles facilities.
- Mail was distributed among "sterile" post office boxes rather than organizations or contractor locations.
- Large and special meetings were conducted off campus in special facilities.
- Reconnaissance specialists could not be associated with Air Force or Navy organizations. Payload camera experts, for example, were transported to and from the launch sites in closed panel vans.
- Communication messages were sent over unique encryption equipment. Telephone discussions were restricted to the use of secure phones, and only in approved vaults.
- Each new member to the security system required a total immersion in the culture through an initial briefing and continuous updates.
- New members were subject to extended background investigations with regular counter-intelligence (CI) polygraphs.
- Projects were compartmentalized to limit the number of people with technical and programmatic knowledge.

- Common sense was repeatedly emphasized as preferable over rigid security rules.
- Byeman security officers were embedded inside each program office to help meet mission requirements; they were integral to program success.

National Policy and Satellite Reconnaissance

The other half of the SP-3 organization dealt with national policy as it applied to reconnaissance satellites. The range of topics was immense as the mission was global, cross-organizational, covert and inherently sensitive. Topics included treaty compliance, cover stories, interagency turf, and international partnerships.

Cathy Swan

As the Deputy for Policy (as a Captain / Major), I was amazed to find myself meeting at the White House with the President's Scientific Advisor. That was SP ensuring the most direct access for the most direct solution.

SP-4: Safety

The Safety function in Special Projects was one of the most under-stated, least glamorous and yet most important activities in SP. SP-4 typically consisted of only one person, usually a major or lieutenant colonel. Yet SP-4 was responsible for all safety aspects of SP contracts, launch operations on both coasts, ground stations around the world, and industrial manufacturing operations across the country. SP-4 had to be a master at leveraging the resources of the program offices, SSD, the contractors and The Aerospace Corporation, in order to succeed.

SP-5: Personnel

> "The office will consist of carefully selected personnel of the highest qualifications, and will be confined to the minimum number required to accomplish the task under the conditions which apply."[55]

[55] Charyk, Joseph. "DNRO Memorandum to NRO Program Directors re NRO Organization and Functions," 23 July 1962

From the beginning, the NRO was directed to hire the best and most experienced individuals the nation could offer. Because of the high priority SAFSP enjoyed, no one was arbitrarily assigned to the organization. All personnel were name-requested, which allowed SAFSP to ensure that the right people were placed in the right System Program Office or support organization.

SAFSP relied upon a powerful tool called selective staffing. The recruiting process began long before a requisition went to the Air Force Military Personnel Center (now Air Force Personnel Center) at Randolph AFB, Texas. In order to be considered for an assignment in SAFSP, two current or past SAFSP members had to attest that the candidate was a fully trained and knowledgeable self-starter.

Jack Kulpa

We weren't passive in our recruiting. We didn't just put in a request. We were looking for good people. We set a SCIF (secure facility) up at Randolph, and I briefed the commander and vice commander there every six months or so.

Once past that hurdle, the hiring process was accelerated through the "Green Door" at MPC, where a small number of personnel specialists tracked requisitions for name-requested individuals throughout the Air Force's "code word" and other selectively manned assignments. Within SAFSP, the Director routinely stayed in contact with the Green Door folks to make sure the organization got and kept the "best of the best."

Ken Caviness

I joined SP in 1964. When I had to go back to the cockpit at the five-year point and they sent me to Korea, General Greer told me I should let him know if I wanted a real Air Force career. Otherwise, he said, he was bringing me back to SP. Needless to say, I came back to SP and stayed until 1979. No job is more rewarding.

As described by Lance Krieger (SP-9), SP followed a three-step process for getting and keeping the right ("on average, above average") people:

- Get the right people by relying on nominees from SMC and Major Commands, records reviews at MPC, and word-of-mouth referrals

from SAFSP alumnae. Look for a balance of youthful enthusiasm and seasoned maturity, and then streamline the hiring process.

Don Hard

I followed Nate in three different jobs – what a delight! Everyone was motivated and charging – not a lot of supervision required; no changes necessary. We spent countless hours working personnel assignments together and with others – both in and out of our own organizations, and in other organizations as well. Nate was all about the selection and empowerment of good people – he took great joy in bragging about what our people were accomplishing – especially our SMC/YO captains and lieutenants during the STS Transition years (1982-1983 for me).

- Empower them with responsibility commensurate with their demonstrated integrity and proven capability.

Lael Henderson

When I was the Deputy Director to Col. Carpenter and Gen Kulpa was SP-1, I was tagged to go to Senior Service School. Jake knew he was going to take over from Gen Kulpa and he called me in and asked me if I really wanted to go. "I have noticed that these schools do more to ruin our officers than help them, so if you stay here I have a plan to make you a Director of one of the programs." I told him I would rather stay in SP and he made me Director of SP-8.

- Nurture them by carefully mentoring their development, training, and career progression. Stabilize their tours to maximize their effectiveness, and rotate them through program offices, operations sites, launch facilities and headquarters so they can broaden their career perspective.

Jack Kulpa

Over time, Air Force Systems Command and Space Division became annoyed that we were taking their good people. Having SP and SD people in the same building was tough. In the end it made sense to move SP into an Aerospace building on the other side of Douglas Street.

SP-6: Research and Development (R&D)

The driving factor behind the success of the NRO – then and now – was the motivation to bring leading edge technology to operations. SP-6's people contributed significantly toward that mission. SP-6 identified and matured advanced reconnaissance technologies. This R&D office leveraged other research organizations, including NASA, the Air Force Research Laboratory and DARPA, as well as internal R&D from SAFSP contractors. When concepts performed up to expectations, the technology was transferred to other program offices, or new programs were initiated.

SP-6 was the "go to" shop for high-priority fixes for satellite anomalies. The program offices brought their contractors together to work on a problem affecting several SAFSP satellites, which helped resolve crises rapidly. This melding of information was facilitated by having an annual R&D members' meeting with Programs B and C. The discussions were wide-ranging and usually ended with challenging tasks to be resolved within the next year. Many technologies that were especially important dealt with pointing accuracies, knowledge of where the satellite was, and batteries, batteries, batteries and more batteries. This cross-cultural R&D approach paid dividends as the various satellite programs leveraged similar technologies, suppliers and research.

SP-6 had many technological challenges. One large one dealt with the transition from analog to digital. Chartered to work on research and development with respect to intelligence systems, SP-6 improved the intelligence value of the Quill data after years of examination and analysis (see Chapter 5). The key was the emergence of digital data technologies in the NRO (SP-6 and other offices), the Air Force's Avionics Lab, the Naval Research Laboratory and innovative companies like the Environmental Research Institute of Michigan (ERIM). This cooperative activity examined the complex makeup of Quill's image formation process and transformed it to an exact digital product of tremendous intelligence potential.

The Quill data was processed optically as an analog signal, which was not very useful to image analysts because it saturated and caused blooming at signal levels a thousand times greater than the threshold values. These signals came from corner reflectors (such as the corners

of truck beds). The huge blooming spots in the imagery were labeled "blobology" by image analysts. The advent of higher power digital signal processors led to collecting and processing the image data digitally. This data had a $1x10^9$ dynamic range which essentially eliminated the blooming and yielded imagery looking very much like a photograph. These technological breakthroughs led to a rebirth of this type of imagery. The photo analysts, after some training, were pleased with the results as well as the increased accessibility of key areas of interest. This led to the development of hardware (transmitters, receivers and processors) for airborne systems, ASARS 1 (Airborne Synthetic Radar System) for the SR-71 and ASARS-2 for the U-2 in the mid-1970s. Overall, this period of cooperative innovation and competition was productive, fruitful and the basis of international stability for decades.

Most of SP-6's work is still classified. Their accomplishments are likely to go unacknowledged for another 20 years, and perhaps longer. In the early 1970's, SP-6 conducted a number of studies on behalf of the Army Space Program Office (ASPO). ASPO was interested in leveraging and exploiting existing capabilities, and so they funded a number of studies and investigations toward that end. One study that grew into an R&D project was the Real Time interim Processor (RTiP). RTiP was meant to demonstrate the feasibility and practicality of rapidly processing the data from an existing satellite. The Army was quite proud of the fact that their experimental RTiP processor was at the time one of the fastest Special Purpose Processors (SPPs) in the world. The initial RTiP prototype processor was a little larger than a toaster, and it was built to demonstrate the feasibility of the concept. Gen Bradburn thought this project was so important that he assigned a Special Assistant, Major David Pilkington, to oversee the demonstration phase in Sunnyvale, California. The demonstration was successful, and the RTiP became the prototype for the development of the hardware and software for a number of follow-on processors.

Rich Wendt

As a member of the AFSCF satellite test and operations staff, I attended an OD-1 Program Review in 1975. During the review Major Bob Paulson briefed the planned ground demonstration of the RTiP. At the conclusion of his briefing, Colonel Bob Griffeth, the OD-1 Commander, asked Bob, "Do

you mean to tell me that this system can replicate the sea of CDC 6600 computers we have?"

Bob thought about it for a minute. "Yes."

SP-7: Hexagon System Program Office

Within Special Projects, most of the "flying programs" had their own System Program Office (SPO). The program director owned the full system development process for his program. "Program Directors will be 'second to command' of the NRO for matters assigned to them."[56] SPO Directors reported directly to the NRO Director on the status of their programs.

Dave Raspet

One of the overarching policies that guided the success of the NRO since its beginning was also promulgated in these early years. Within the Defense Department, the Department of the Air Force was assigned as 'the operational agency for management and conduct of the NRP (National Reconnaissance Program), and will conduct this program through the use of streamlined special management procedures involving direct control from the Office of the Secretary of the Air Force to Reconnaissance System Project Directors in the field, without intervening reviews or approaches.' This 'single manager' philosophy formed the basis for SAFSP's organization. In fact, this philosophy was a direct outgrowth of the Corona program experience.

SPO Directors empowered development, operations and launch teams, and mid-level managers supported the people who were accomplishing the mission. Having smart leaders empower and trust their people made it easy.

All support functions (R&D, security/policy, budgeting, contracting, and safety) understood that Mission Comes First. As such, each support office identified individuals to physically sit with and operate day-to-day in each of the Program Offices. These embedded players were essential to program success by aggressively solving problems as they surfaced, many times without even advising the program offices until after

[56] DoD-DCI Agreement (July 23, 1962).

implementing the solution. The embedded members of the team personified the concept of empowerment.

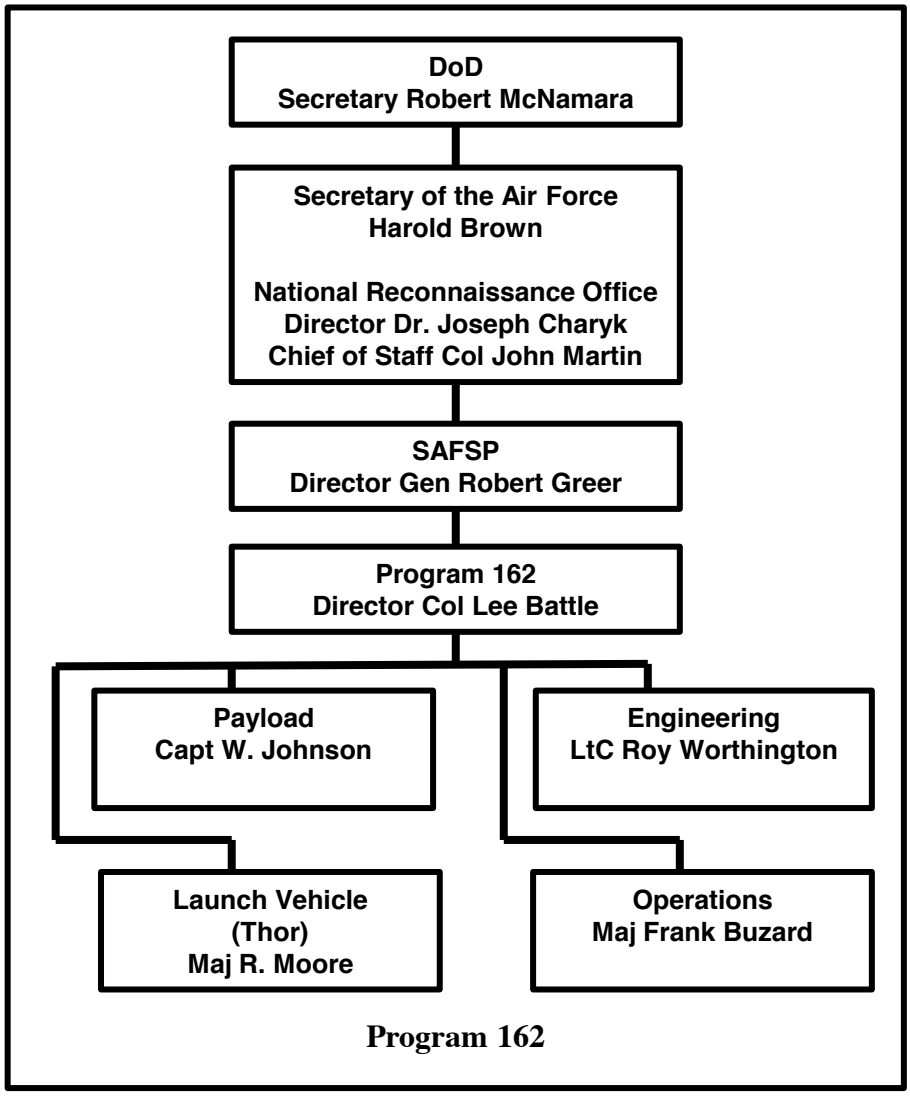
In addition, the key relationships between the SPO leaders and their contractor teams ensured rapid identification of issues and timely discussions leading to commonly agreed upon solutions. Each of the program managers had a direct line to the contractor team leaders as well as the responsible vice presidents – and it was used often.

In the early days, SAFSP's wide-area search programs (Corona, SAMOS and 7A, a related launch integration effort) were in SP-7. When Corona transitioned to SAFSP in the early 60's, the organization emphasized the characteristics of SAFSP's management approach: small, direct access to leadership, and empowered. The next figure shows the Corona program as it transitioned to SAFSP.

Similarly, in 1966, the Program A portions of Hexagon development, as the follow-on to Corona, were managed by SP-7. In 1973, all Hexagon efforts previously run by Program B were transferred to SP-7. Thereafter, all Hexagon efforts through the end of the program in 1986 were the responsibility of Program A.
gainey

Tom O'Neill

Throughout SP there was a tremendous feeling of empowerment. None was empowered more than the SPO Directors. They were supreme in all things pertinent to their effort. How each set up and ran his Program Office and programs was a manifestation of his personality and the unique history of his programs. When I transferred to SP-7 from Perkin Elmer in 1975, Ray Anderson was the SPO Director and Les McChristian ran the Engineering Division. Whenever I had a payload idea that I needed some funding to pursue, I'd make up a summary page, go down to Ray's secretary and see if I could get in for a minute. Most times, if he was there, I was let right in. I'd explain the issue, the benefit of pursuing it, my plan, how long it would take and how much budget was required. If Ray was interested he'd reach into his uniform shirt pocket, pull out a little worn brown address/notebook that I later found out contained his notes on the program budget and liens. He'd thumb through the pages until he found the data he was looking for, pause a moment, and either tell me, "Yeah, go for it," or not. Ray's "Little Brown Book" approach to program control was typical of SP's streamlined culture and history.



Program 162

In early 1978, with the flyouts of both programs scheduled for the mid-1980's, General Kulpa combined the Hexagon and Gambit programs in a new SPO, SP-21. Ray Anderson, who had been the head of SP-7, moved up to become SP-2A. Les McChristian, who was the head of SP-14, became the SP-21 Director. The synergy and overlap of expertise across the programs allowed for some reduction of manpower and improvement in efficiency in the government and contractor teams. In 1983, General Jacobson reconstituted SP-7 under Larry Cress until the end of Hexagon in 1986. In 1989, the now-vacant "SP-7" office

designation was assigned to Col Bob Mihara to support an effort that ended in 1991.

Don Thursby

An "all-scientific" spacecraft, sponsored through SP-7, was a real Christmas tree of experiments, to be launched off a Corona pad. Unfortunately, winds aloft were strong on launch day. The Thor-Agena performed perfectly and was correcting being blown off course but not enough nor in time. It crossed the Range Safety Line and was blown up, scattering parts all over the base. Being a SAC base, the alarm sounded and all hands were sent into the fields to recover parts. Even cooks from the mess hall – airmen were roaming everywhere. A Payload Recovery Team was in place. I was stationed in the Near Fallback Area with radio telephone, a pickup truck with a chest of hazard suits and boots, and industrial strength Glad bags for stuffing film and whatever camera parts could be recovered. A Lockheed backup team, fire trucks and medics were in the Far Fallback Area, but the real problem was how to close the entire fallout area off from the thundering hordes.

SP-9: Contracts

As with Security, SP-9 contracting officers were also assigned to individual SPOs.

Lance Krieger

SP-9's job was straightforward: Ensure timely support to the Program Managers through embedded and empowered contracting officers. The process to ensure timely support was continuous, but started with hiring, training and keeping the best talent that fit into the SP philosophy and could handle the responsibility.

Before any new assignee went to work in SP-9, they were fully trained and experienced in how to execute contracts. The development of "9'ers" over four or five years was enhanced by moving them through different SPO assignments that increased in complexity (e.g., start with small and rapid R&D contracts inside SP-6, then move them to a subsystem or O&M level set of contracts before assigning them a full system of their own). While in the training program, SP-9 made sure they had a "can do" attitude in their job. One essential approach was to

first look at the FAR (Federal Acquisition Regulation) from the standpoint of what it allows, before looking at what it prohibits.

Pete Swan

As a program manager for a small R&D satellite, I remember that then-Captain Gail Allen always answered the question, "Can we do XY&Z?" with, "I am sure we can. Let me work on it."

Many of my requests "pushed the envelope," but Captain Allen and SP-9's attitude was always, "How can we achieve the mission and stay within legal requirements?"

While working with selectively cleared people who supported the streamlined management philosophy, SP-9 contracting officers encouraged partnerships across government organizations (SMC, Air Force Systems Command, DCMA, DCAA, etc.) to ensure the best possible outcome for the taxpayer. As part of the maturing of the SAFSP contracting officer cadre, the concept of developing a close, yet arm's-length, working relationship with industry was enhanced by stationing SPO and SP-9 personnel at key plants. One of the basic approaches for SAFSP contracting officers was to incentivize the industry with win-win outcomes. A principal tenet in this approach was to make sure that every contract was written to "secure success on orbit" as a common goal between the government and the supplier.

Gordon Orme (SP-6)

One day Jerry Van Ormer (SP-9) and I were negotiating a contract. When Jerry made the company an offer, the guy said, "Well, if that is all you can give us, I guess we will have to take it."

Jerry whispered really loud to me so the guy could hear it. "He ought to give me a counter."

The guy came back and said, "How about if we split the difference?" And that is what we settled on.

SP-10: Mission Operations

The Original Concept: The role of SP-10 changed over the years as the number and focus of various satellite programs, and SP itself, matured. In the beginning, General Greer realized that building a piece of hardware that actually worked in space was a significant challenge for

any SPO director. SAMOS had illustrated the two-fold nature of problems facing SP. First, there was considerable confusion over roles and missions in Washington, DC, and second, space was a new frontier. Building complex equipment that actually worked in that unique environment was very hard – the many failures and problems with early space hardware, including SAMOS, Corona, and launch vehicles had shown that.

General Greer wanted the person responsible for actually building working pieces of space hardware to focus his efforts and talents on that difficult, groundbreaking task and not be distracted. At the same time, he wanted to be actively involved in the Washington, DC interfaces between agencies.

He was especially concerned about how SP should operate these satellites once they were built. As a strategy to implement this vision of West Coast-focused operations, he established SP-10 to serve as his action agent in that interface and to report directly to him on all programs. It soon became apparent, though, that if SP-10 were only an interface coordination group, they would be more like a staff function. The director of SP-10 successfully argued that he needed a definable product in order to help him meet the challenges he was being asked to take on.

As a result of this perceived vacuum, procurement of the targeting and reporting software was assigned to SP-10. The functions of that software were the primary interest of the Washington, DC Intelligence Community and other users of the product. To coordinate the real-time aspects of identifying intelligence targets and then executing the operations during a mission, a small SP-10 office (SP-10A) was established in the Satellite Test Center (STC).

To coordinate the changes and improvements with the user interface, an additional office was established (manned by one officer) in the National Photographic Interpretation Center (NPIC) located at the Navy Yard in Washington, DC. NPIC was the principal exploiter of the photographs taken by Corona, Gambit and Hexagon. The mission of this outpost was to gain feedback from the photo-interpreters that would help improve hardware performance and targeting considerations.

In the early days, there was considerable effort in the improvement of targeting. SP-10 led the activities of a Performance Evaluation Team (PET) that assessed missions from the viewpoint of the photos collected. In addition, each satellite SPO sent people to assess the hardware performance on the flight. SP-10 was the leader ("Mission First") and team coordinator for PET, with the satellite SPOs concerned with hardware issues.

Software Development: In the early days, SP-10 acquired and operated software that controlled the mission operations of each of the SP satellites. For the satellite photography missions, that meant where to point the satellite and when to turn the camera on and off.

Ned Gould

During the days of Hexagon software development, SP-10 had an extraordinarily challenging task. There wasn't a person outside our two-person team who thought we would deliver on time. They knew we would hold up the launch. But we made it.

SP-10 also acquired a mission planning package for the electronic satellites. As the builders of the targeting software, which was quite difficult in the early years, SP-10 became SP's center of excellence for how to develop software. This was particularly tricky as this small but essential contract could hold up a very large and expensive satellite launch if schedules were not met. Software development schedules were just as difficult in the 1960's as they are today.

Rich Wendt

In the mid- / late-1980's Gen Jacobson hosted a Dining Out at one of the hotels near Los Angeles AFB. The guest speaker was MGen Robert "Rosie" Rosenberg, an SP-10 alumnus and at that time Director of the Defense Mapping Agency (predecessor to today's National Geospatial-Intelligence Agency). A group of us from OD-1 and OD-4 made the trip from Sunnyvale to the event. During the cocktail hour my wife and I were listening to a conversation between Gen Rosenberg (5'-1" maybe) and Col Jan Molvar (6'8") – two old friends from early satellite operations in the 1960's. I could tell it bothered the General until eventually he said, "Oh hell, let me do this." He then pulled one of the banquet chairs away from the table, stood on it, and finished the conversation with Jan Molvar eye to eye.

Mission Studies: As they worked with mission software, SP-10 became the focus of studies to ascertain the most advantageous orbits from a collection standpoint, to estimate the increased collection possible for proposed improvements, and to quantify performance of the different programs against new or varied collection requirements. They became the focal point for mission studies for satellite hardware changes and the interface with Washington for requested improvements to hardware or unusual operations using existing hardware. This architectural comparison of satellite system functions became quite significant in the late 1970's and early 1980's when the NRO was contemplating significant changes to its overall configurations. This included the evaluations of mixes of satellites to provide data for a growing set of requirements and performance made possible by leapfrog advances in sensor technology.

Military Support: As time went on, SAFSP grew in program numbers, budgets, and interfaces. The black magic of computer programming was eventually conquered in the late 1970's. The software development focus of SP-10 changed and transferred back to the hardware SPOs in the late 1970's and early 1980's.

During this period the number of SP program offices had grown to where SP-1 involvement in daily operations was somewhat reduced. The emphasis on budget concerns changed the Washington interfaces such that it made more sense to have a total intelligence satellite program under a single SPO director. This occurred first in SP-8 and SP-11. As Hexagon and Gambit operations phased out, SP-10's software development role diminished. Their mission study role continued and the mission interface role made them the logical choice to expand the efforts to communicate with military users in the field. This led to more effective ways to support the warfighter directly.

SP-10 actively interfaced with military units in the field by providing simulated intelligence from NRO systems to military units conducting operational exercises. Thus, SP-10 became the interface with ground, naval, and air units to support military users directly (aka "Black TENCAP"). NRO systems were now being leveraged for both exploitation of NRO data and to build systems to support user tasking.

Ned Gould

There was a lot of interplay with SP-10, and some friction with the hardware SPOs who didn't want their satellites pushed to the breaking point. SP-14 (the Gambit SPO) did not like the high-inclination orbits because of thermal aspects and fewer station contacts. SP-10 loved them because they went over more high-priority targets more times during the mission. This brought both points of view (mission accomplishment and safety) to the SP-1 office and the Director got to make the final decision. A nice set of checks and balances for the general. A point of annoying friction for the colonels.

As Special Projects programs developed over the years, their utility expanded to supporting national decision-makers with strategic Indications and Warning (I&W), Technical Intelligence, Support to Military Operations, and Tactical Exploitation of National Capabilities (TENCAP). The SAFSP customer base expanded from users primarily based in the Intelligence Community, to warfighters at all levels of command – around the world.

Because the NRO wasn't an acknowledged organization, it was difficult to link warfighter requirements to SAFSP capabilities. This gap drove the evolution of SP-10 to being SAFSP's "storefront" for the warfighter.

ITEP (Interim Tactical ELINT Processor) Vans: The first significant step was development of a deployable van to communicate directly with one of the satellites. During the late 1970's, there was a need for providing intelligence from overhead satellites to DoD operators. Then-Captain Robert "Bob" Mihara was tasked by then-LtCol Bob Paulson to transfer a developmental van to the Army. His tasking was instrumental in expanding the focus of the NRO from just the Intelligence Community, to a combination of Intelligence Community and operational DoD support. His vans and their follow-ons became critical elements of operational forces deployed around the world, especially inside Iraq and Afghanistan. Modern versions are in use today. The Army heavily invested in the ITEP van and other TENCAP applications, leveraging NRO capability despite not having a "Program C" as the Navy did.

The initial development of the van was done in SP-6 and SP-8 by Captain Mihara. However, the SP-8 Program Director, Colonel Paul Foley, concluded that once the development was done, the operation was a distraction to his primary role of building and operating satellites.

As such, the responsibility for the military support vans was transferred to SP-10.

Jack Kulpa

In the beginning, the ITEP vans were not well understood and did not have much support. We wanted to introduce and get support for the program from the military community so we planned a demonstration in the Washington, D.C., area. We wanted to get as many flag officers and other key people to attend so that they would understand their potential. This was to be a big show and tell. Bob Mihara was to accompany the van on an Air Force transport plane from California to Andrews AFB. At three in the morning I received a call from Bob. "General, we are at Andrews, but we had an incident while unloading the van. We dropped it." That woke me up. Luckily, there was no serious damage from our inadvertent drop-test of the van.

Many of the flag officers in Washington visited the demonstration and it was a big success. Among the visitors was Dr. Hans Mark, the DNRO. We waited until evening for his demonstration. On the drive to Fort Belvoir, Dr. Mark told me that he was not sold on the ITEP scenario and he wasn't sure we should spend the effort. The Army Corps of Engineers boss was a classmate of mine at West Point and he had given us all-out support for the demonstration. The van was on a field with two rows of barbed wire surrounding it. A wooden plank walkway led out to the van. As luck would have it, it had been raining all day and the field was a quagmire of mud. It looked and felt like a real combat situation. After a pre-briefing in an adjoining building, we proceeded to the van. Even with the wood plank walkway it was a messy walk. The van worked perfectly, showing an Eastern European scenario. Our guys were all in combat dress and it really was impressive.

The demonstration was a great success and on the drive back to the Pentagon, Dr. Mark spoke in glowing term of the applications and potential utility. Eventually many vans were put in the field with operational units.

Rich Wendt

In addition to the Army ITEP vans, SP-6 / SP-10 built Air Force ITEP vans. Prior to the first delivery of an Air Force ITEP van we demonstrated its utility by deploying both the development van and the simulation capability to an Air Force Blue Flag exercise at Hurlburt Field, Florida in 1979. Blue Flag exercised the command and control capabilities for tactical air forces in a

deployed exercise scenario, in this case the Fulda Gap in Germany. At one point the Deputy Commander of 9th Air Force visited us. Bob Mihara had stepped away, so I briefed the General on the simulation capability, the satellite systems and the ITEP. When he saw a screen shot from the ITEP he complained that there was no intelligence value in seeing a solid wall of black dots representing Soviet air defense radars in East Germany. Afterward the Air Force Captain who escorted the General said that he understood the General's comments, but the screen shot told the Captain a lot: their job combating the Soviets was going to be very difficult. Who would have guessed that ten years later there would be no East Germany, nor any Soviet air defense armada in Europe?

Vietnam: The Corona and Gambit imagery programs recognized early on that they needed to be able to predict cloud cover in order to avoid wasting film on clouds. This need drove the NRO to develop a DoD weather satellite (see Chapter 4). The Defense Metrological Satellite Program (DMSP) was developed for the DNRO by a small team working for General Greer. The immediate need was to precede Corona, identify cloud coverage (basically looking for cloud-free areas where the satellites could take pictures) and then download the imagery to a ground site that would forward the information to the Corona program office.

Jack Kulpa

During the height of the war in Viet Nam the weather was having a major effect on air operations. Targets were often cloud covered, sorties were canceled and planes had to dump their bombs over the ocean.

Program 417 was asked if it could help. A plan was developed to build a special one-of-a-kind satellite and a ground station at Tan Son Nhut Air Base near Saigon. RCA would build a newly designed satellite with three cameras to see from horizon to horizon, and Radiation Inc. would build a new ground station. Between Christmas and New Year's, designs were conceived on blackboards and recorded by Polaroid camera. On January 2 work was authorized with a handshake. It wasn't until the end of January that a letter contract was issued.

In the middle of May the ground station was completed and operating, and a new one-of-a-kind satellite (417 Block 3) was launched. Only five months from handshake to combat operations for a newly designed satellite and ground station. That is probably a record not to be broken. Because of its success additional ground stations were put at

Udorn, Thailand, and on a carrier off the coast, and final target selection waited for the 417 satellite pass each morning.

During the Vietnam War, DMSP became so critical to weather prediction that it was declassified from the NRO and allowed to be tasked as a DoD asset in the "white" world.

SP-12: Finance & Budget

Along with SP-3 and SP-9, SP-12 was embedded in each of the "flying SPOs." SP-12's responsibilities were twofold: build the budget justification materials necessary to secure congressional approval for SAFSP funding, and account for every penny of those appropriations as they were passed to contractors who supported SAFSP. A monster job in terms of dollars, carried out by a skeleton staff. Eventually, an SP-12'er was assigned to each SPO, plus three or four accounting specialists who processed the SPOs' funding authorizations and expenditures.

Joe Parks

When I was assigned to SP-12 in 1972, we were doing the budgets in the SP management manner; with small staff, full empowerment and limited reviews. Our small team (five budget officers, two accountants and one secretary) initially used 10-key calculators and manual spreadsheets. This was a budget with multiple programs, hundreds of line items totaling in the billions of dollars. When all the estimates were finished, it was then typed and after the typing it had to be footnoted and cross-footnoted for accuracy. As you can imagine, this was a long tough process that never quite balanced. There were a number of times we just couldn't find all the mistakes and plugged numbers to make it balance before it was hand carried back east. Never once was the accuracy questioned by anyone. I remember one time where the typist had left out $5 million in a particular line item. I told the SP Deputy I would get it back in the next cycle as it was too much trouble to retype it.

In 1974, we converted a NCR 399 accounting machine to do a real basic version of the budget similar to Microsoft Excel. This version could add and print. What an improvement, saved hundreds of man-hours. We then noticed that our flying SPO's were using computers for much of their technical work. In 1976, we moved the budget process to a couple of HP-9830's (desktop computers/calculators) that we hooked up to a CRT and a

printer. This system was much easier and faster than the NCR 399. In that time period, the HP-1000 came out. In about a year, we had a real computer system and not only were we able to do the budgets on, but were able to start modeling program costs which was the first time to my knowledge that it was done in the space business. The front office became very interested in the capabilities of the system and soon we were doing a variety of administrating functions for the entire West Coast SP operation. This capability was migrated to our offices in the Pentagon and by 1979 we were completely integrated throughout the entire organization.

For "black" contracts, SP-12 served as the equivalent of the Defense Finance and Accounting Service (DFAS) and made very prompt payments to the contractors, which reinforced SP's reputation as a preferred customer.

As the budget complexity grew over the years, the diversity of outside monitors steadily increased. SP-12's unwavering focus on supporting the SPOs and maintaining the integrity of the process was paramount. Their control mechanisms remained state of the art, and accurate to the penny. Thanks to superb staffing in the SPOs and in the finance office, SP-12 kept the mission moving forward and the financial community satisfied with the quality of the financial documentation.

In recognition of the tremendous impact that SP-12 had within the satellite reconnaissance community, Mrs. Jane Wood was awarded the title of "Pioneer of National Reconnaissance" in 2006. The citation was crafted to show Mrs. Wood's contribution, but reflected the crucial financial support provided to the mission by her organization (she became SP-12's Director during her last few years):

> "Ms. Jane Wood pioneered the development of a budget and accounting system that accurately tracked expenditures for many of the most sophisticated U.S. space assets. She was preeminent in the national reconnaissance fiscal world in the development of reliable budgets for complex satellite programs, establishing an environment of financial stability that furthered the growth of reconnaissance capability."

Cathy Swan

After Mother (Jane Wood) turned down the job of Director of SP-12 numerous times (she believed it should be a military officer), she became its only female Director. She is also the only woman Pioneer of the NRO.

SP-14: Gambit Program Office

In its summary report following the conclusion of the program, the NRO concluded that Gambit was considered highly successful in that it produced the first high-resolution satellite photography, 69.4% of the images having a resolution under 3 ft. (0.91 m); its record of successful launches, orbits, and recoveries far surpassed the records of earlier systems; and it advanced the state of the art to the point where larger follow-on systems could be developed and flown. The report also stated that Gambit had provided the Intelligence Community with the first high-resolution satellite photography of denied areas, the intelligence value of which was considered "extremely high."[57]

Ken Caviness

When then-Colonel Bill King was the Gambit program director, we had only 11 military people trying to run two programs at the same time. The original Gambit program (built by GE) was still flying, and the improved Gambit-3 program (built by Lockheed) was in development. We were working our tails off trying to keep both programs on track.

One day, then-LtCol Hank Stelling decided we had to call for help, and he volunteered me to plead with Bill for reinforcements. Bill hated to see growth of any kind, but reluctantly agreed to add three people. As he put it, now we had 14 people in SP-14, and he let me break the news to the team. Needless to say, they were less than enthusiastic about the paltry increase.

In 1984, President Reagan accentuated the value of Gambit in a speech to the NRO, an excerpt of which follows:

> "When the GAMBIT Program commenced we were in the dawn of the space age. Technologies we now take for granted had to be invented, adapted, and refined to meet the Nation's highest

[57] "Summary Analysis of Program 206 (GAMBIT)". National Reconnaissance Office. 29 Aug 1967

intelligence information needs while exploiting the unknown and hostile medium of space. Through the years you and your team have systematically produced improved satellites providing major increases in both quantity and quality of space photography.

"The technology of acquiring high quality pictures from space was perfected by the GAMBIT Program engineers: GAMBIT photographic clarity has yet to be surpassed.

"Through the years, intelligence gained from these photographs has been essential to myself, my predecessors, and others involved with international policy decisions.

"These photographs have greatly assisted our arms monitoring initiatives. They have also provided vital knowledge about Soviet and Communist Bloc scientific and technological military developments, which is of paramount importance in determining our defense posture.

"A generation of this Nation's youth has grown up unaware that, in large measure, their security was ensured by the dedicated work of your employees. National security interests prohibit me from rewarding you with the public recognition which you so richly deserve.

"However, rest assured that your accomplishment and contributions are well known and appreciated at the highest levels of our Nation's government."[58]

Lael Henderson

We were launching Gambit on a very foggy morning and we kept hearing this loud foghorn. Just before the launch window opened, the fog cleared enough that we could see down to the beach – and there was a large cargo ship that had gone aground. They would have to unload the cargo before the ship could be moved, and that would take weeks. We had to work through the risk before we could launch, but as I remember the decision was finally made to go ahead. The crew of the ship had a ringside seat for the launch.

[58] Gambit Story, pg 117.

The Gambit program had been managed in SP-14. In 1978, with both the Gambit and Hexagon programs winding down, General Kulpa combined SP-7 and SP-14 in a common SPO (SP-21). Col Les McChristian, SP-14 Director, was named the head and Col Ray Anderson, the SP-7 Director, moved up to become SP-2A. In 1983, Gen Jacobson, renamed SP-21, SP-7, with Col Larry Cress as Director, and Les McChristian moved up to become SP-2. (See Chapter 4 for satellite descriptions.)

SP-16: Launch Integration

Dave Raspet

SP-16 had a barbeque and I gave Gladys Mena a list of people to invite. I included Tonu Bruns since he had been in SP-7A. A few weeks later I saw Tonu in the halls of Boeing and asked if he had gotten the invitation. He told me no, he hadn't seen it. I asked Gladys what happened to Tonu's invitation and she told me, I didn't know who he was so I didn't invite him.

Now you know who really ran SP-16.

Gladys Mena

As anyone who has ever watched a Shuttle or conventional rocket launch knows, launch is a big deal. It's not just the rocket and the satellite to consider. There are also upper stages, the launch platform, and range support. There are literally millions of moving parts, any one of which can, by itself, cause a billion-dollar failure. One of the most difficult challenges to an NRO program was the fact that the launch integration cycle, as well as the launch itself, represent the greatest risk to a satellite as well as the greatest risk of exposure for these classified payloads.

Don Walker

You will never remember the launch slips, but you will never forget the launch failures!

In the beginning, each satellite program office was responsible for integrating its rocket. In the early 1970's, the effort to integrate another program's satellite onto the Titan IIID rocket began in SP-7A, a new office using a hallway inside SP-7. SP-16 was stood up as an outgrowth

of SP-7A, still using the SP-7 hallway. SP-16 was the Shuttle Launch Systems Integration focal point for all NRO programs with Space Division (predecessor to today's SMC) and NASA, and the launch integration focal point for the CIA's Program B and the Navy's Program C.

Don Hard

SP-7A started the work for an alternate configuration for Titan. SP-16 grew from that. We stayed in the SP-7 area for some time and then moved. We started SP-16 in late 1975. I had just transferred down to Los Angeles from SP-7 in Sunnyvale that summer, and was supposed to go into SP-10. That fell through, and Lou Neuner and Ray Anderson told me to talk with Don Alser and Nate Lindsay, who were just setting up SP-16. I did and they hired me into the newly chartered SP-16 office. Don left after just a few months, and Nate took over. Later, Bob Christian and Larry Gooch followed. Other original members included Tonu Bruns, Bill Duncan, Bill Nicholau, Ed Puscher, Paul Purtle, Bob Mann and Jay Burkhart.

We worked STS transition for all NRO payloads, and helped with other non-SP program launches on ELVs, including the other Titan payloads and some SIGINT payloads on Atlases. A big piece of our early STS transition was the modification of SLC-6 (the original design did not accommodate NRO payload requirements). Bruce Baron and Seb Coglitore helped up at Vandenberg, then Seb transferred to Los Angeles. Another big effort was defining our security requirements for NASA, which resulted in the "Controlled Mode" approach for the NRO's launches on Shuttle. Fun times!

SP-16 had a difficult integration task. All program offices, their military customers and the national leadership depended upon successful launches. SP-16 was responsible for all NRO launches and launch integration, which included Programs A, B and C satellites. Because Space Division had few clearances into Intelligence Community programs, SP-16 provided a security cut-out between the CIA and Navy NRO spacecraft providers and Space Division launch personnel. In addition, SP-16 provided facilities to support NRO spacecraft at the launch bases.

Steve Soukup

A couple of the SPOs actually did their own launch system integration (LSI) even after SP-16 was established. My old program (SP-11) was one of those. I joined SP-11 in Sunnyvale as part of the AFPRO cutout working for SP in 1975. First on Hexagon, then on the SP-11 program. When I PCS'ed back to LA in 1978, the LSI function was firmly embedded within SP-11, possibly because the first SPO Director of SP-11 after it split off

from SP-8 was Don Alser, an old launch guy. We used SP-16 to BUY the rockets for us, and included the SP-16 guys in our LSI activities, but SP-11 ran the LSI work for the program (occasionally to the great consternation of the SP-16 leadership). Anyway, SP-11 and one or two others held the LSI function pretty closely right up until the end.

Paul Foley

SP-8 had an integral LSI organization dating back to the late 1960's. Run by then-LtCol Jack Symington, members included Gary Geyer, Jim Everitt, Jay Starnes, Larry Barlock, Larry Penney and others. When SP-11 spun off in 1975, Papaccio continued the practice of payload office LSI, and I'm sure Don Alser was a strong supporter.

The organization's early launch history was less than auspicious, as failures were frequent and expensive. Many of the satellites lost were truly unique designs, with features tailored for specific reconnaissance objectives. Several failures damaged the launch stands as well as destroying expensive, one-of-a-kind spacecraft. SAFSP learned from those failures that there was absolutely no recourse except a 100% focus on Mission Assurance. As valuable as the satellites were, every launch detail had to be inspected carefully and critically.

Dave Raspet

After a "wheat field Atlas" started to turn around and head back to the launch site, General Kulpa ordered SP-16 to buy a new-build Atlas for our customer. SP-16 managed 19 contracts and served as the integrator, consolidating Space Division products, General Dynamics products and products from other suppliers. The total SPO manning for this effort was Captain Alan Caraway and Jim Minos from Aerospace. All five Atlas Hs were successes.

SAFSP worked closely with industry, The Aerospace Corporation, and throughout SMC to improve the launch success rate. Performance steadily improved over the years. Today it is setting new standards of excellence on every launch (knock on wood). In 1997, Director Keith Hall summed up SP-16's responsibilities:

> "Special Projects was responsible for launching them all. As you well know, the launch is the riskiest phase in the deployment of a

satellite. There were some glitches along the way. An early launch from Cape Canaveral failed to orbit and some of the debris landed in a Cuban pasture, killing a cow. It was the first time that U.S. space capabilities had been used to make ground beef. We decided not to pursue that particular mission area and started launching from Vandenberg. Kidding aside, the vast majority of launches were successful. I would like to thank Special Projects for providing this critical service for the NRO."[59]

Don Thursby

The coastal tracks being there before VAFB, trains had right of way. Launching while any train was on base was prohibited so their presence played havoc with the launch countdown sequence. Airmen were stationed at the north and south ends of the base tracks to report train arrivals and departures, and a helicopter patrolled the tracks, beaches and coastal waters to give the "all clear."

Jack Kulpa

Every launch was a breech birth. Launches from Vandenberg were especially dicey because of the weather, and even the trains running up and down the coast took priority. We were lucky a couple of times when a truck got stalled on the tracks outside Vandy and we were able to get the launch off.

Steve Soukup

Don Thursby spent a while up at Vandenberg launching Corona, and he has told me stories about the time(s) that an Air Force helicopter would mysteriously "lose power" and have to make a forced landing on the railroad tracks – at just the right time.

Air Force Support

Any discussion of value to National Security would be grossly insufficient without highlighting SP's unique relationship with exceptional partners. Throughout this monograph, we have addressed the incredible contributions of SMC, The Aerospace Corporation and, of course, industry. Within SMC, program offices who worked seamlessly with SAFSP include the launch SPOs, the Satellite Data System (SDS) SPO,

[59] Comments given by former DNRO Keith Hall at the SAFSP Alumni Christmas Party (December 6, 1997).

and the Defense Dissemination System Program Office (DDSPO). The Aerospace Corporation took the same focused approach in their support of these programs as SP did. They dedicated MTS (Members of the Technical Staff) to each program office, streamlined their reporting procedures, gave them full access to Aerospace Corporation laboratory and technical resources, and worked shoulder to shoulder with SP and industry engineers in building these extraordinarily complex, one-of-a-kind programs. Four other Air Force agencies deserve recognition as well.

The Air Force Satellite Control Facility

"The AFSCF was a space command and control unit located at Sunnyvale AFS (later Onizuka AFB), California. It has the distinction of being heavily involved in the world's first reconnaissance satellite program, Corona," and its support to NRO programs since then has been fascinating and worth a separate paper in itself.[60]

Built in 1960 on land near Moffett Field purchased from Lockheed, the station was originally known as the Air Force Satellite Test Center. Activated in 1965, it was later renamed the Air Force Satellite Control Facility, and Sunnyvale Air Force Station.[61]

In many ways, the AFSCF's motto on its patch reflects the operating philosophy of the NRO family: *Inveniemus viam vel faciemus* ("We find the road or we make it"). Sounds like something Jake could have introduced.

6595th Aerospace Test Wing

Don Thursby

An important part of the Corona countdown was the "twang test." The launch vehicle was lassoed, the rope hanging from the top of the rocket out across the launch pad. When it came time to verify the inertial guidance gyros were up and running, the rope was snapped, sending a wave up the rope and banging against the vehicle, jostling the guidance package. The telemetry would verify the gyros were spun up and operating properly.

[60] http://en.wikipedia.org/wiki/Air_Force_Satellite_Control_Facility
[61] http://en.wikipedia.org/wiki/Onizuka_Air_Force_Station

Rick Larned

When I read Don's story to my wife, Sue's first question was, "What happened to the rope if it was tied to the rocket?" Don reassured her that the rope did not go downrange to Thor Booster "mountain" in the Pacific off Baja Mexico. The lasso was tied with a boat mooring hitch, which is a quick-release knot. The "rope wave" was created with a "snap" of the arm, and then the lasso was released by a "yank" on the rope, courtesy of the Space Cowboys on Thor launch pads.

At Vandenberg, the 6595th Aerospace Test Wing helped the NRO launch polar-orbit satellites on Blue-Scout, Thor, Atlas and Titan boosters from Space Launch Complexes 1-5. In the early days of Corona (Discoverer) the missions were flown on Thors out of SLC-1 and -2. Later Corona missions on the Thrust Augmented Thor (TAT) flew out of SLC-3. The first block of DMSP weather satellites that supported Corona tasking were flown on Blue Scouts out of SLC-5. Early Gambit vehicles were launched from the SLC-4 pads on Atlas. These were subsequently transitioned to Titan pads to handle the larger Gambit upgrade (SLC-4W) and Hexagon (SLC-4E). The sites on South Vandenberg were initially referred to as Point Arguello Launch Complexes (PALCs). Their names were later changed to Space Launch Complexes (SLCs).

Stephen Gourley

Although thought of as two separate pads, SLC-4 East and -4 West were served by the same support facility and block house, being relatively close together. It was not unusual to have a rocket on each pad at different points in their cycle. That came to an end in April 1986 when a Titan 34D coming off of SLC-4E blew up on launch and nearly decapitated a Titan III on SLC-4W, narrowly avoiding costing the NRO two boosters and their satellites in a single launch failure.

The boosters were augmented by assorted combinations of solid rockets for greater lift, and with upper stages, e.g., Agenas, Able-Star, Burners or Titan Transtage. A full spectrum of "INT" payloads, each with special orbital needs, drove the launch vehicle stack requirements behind the scenes.

Don Thursby

All VAFB SP launch dates were supposed to be secret, but dates for the coming week were posted by Harbor Masters on nearby public beach piers to give commercial and sport fishermen the date and times to avoid restricted waters off the base coastline.

The “Factory-to-Pad” concept was still being conceived, so last-minute retrofits to the boosters, upper stages, and satellite payloads were being implemented at the launch sites, which compounded launch integration readiness. The Gambit follow-on was the first program to implement the factory-to-pad concept and it saved many dollars and shortened schedules.

Don Thursby

All trucks entering VAFB were stopped at the main gate for inspection, so getting the secret Corona spacecraft in presented a real problem. The drill was to meet the Corona transport truck (white, no markings) from Palo Alto on the back road at 0300 hours. Myself in uniform and Air Force blue car, I flash my car lights once, they flash the truck’s twice for ID verification. We stop at the Main Gate and the truck pulls up behind me so we’re bumper to bumper. I tell the guard I am escorting the truck to the Missile Assembly Building (MAB) and put the pedal to the metal. The truck stays glued to my tail and follows me into the darkness.

For each launch a Launch Readiness Review was conducted at the launch base, with the Program Office’s launch vehicle and satellite people attending. These reviews followed months of coordination and frequent visits from the Program Office, but this was just the tip of the iceberg. The SP Program Office also coordinated with their Air Force counterparts at Space Systems Division (Air Force Systems Command) in the procurement, build and delivery of the required configured launch vehicle stack. All of this effort represented an enormous front end of the launch integration cycle.

Don Thursby

The Corona spacecraft, Agena upper stage and Thor booster were integrated horizontally on the transporter erector. Standard procedure before mating the spacecraft was to roll the Agena 360º to see what fell out. The usual bounty? Missing tools, clipped wires, fasteners, rolls of tape, even crunched lunch bags and soda cans.

6555th Aerospace Test Wing

The 6555th Aerospace Test Wing at Cape Canaveral was responsible for the development of USAF missiles, both tactical surface-to-surface; CIM-10 Bomarc interceptor; SM-62 Snark intercontinental cruise missile; intercontinental ballistic missile and heavy launch rockets used by the military for satellite deployment, including NRO launches to geosynchronous orbit.[62]

Redesignated a Group in 1970, the 6555th established its Space Transportation System (STS) Division in 1974. The Division was created to ensure that Defense Department requirements were included in plans for future Space Shuttle operations at the NASA Kennedy Space Center (KSC).[63]

6594th Test Group

The 6594th Test Group was stationed at Hickam AFB from 1958 until it was inactivated in 1986. The 6594th was established to support Air Force Systems Command missile and space development operations in the Western Pacific. It also provided support to the U.S. Coast Guard and Honolulu Joint Rescue Coordination Center on an as-available, non-interference basis.

Large portions of the Test Group's mission were classified until 1995 when information concerning Corona was declassified. The 6594th was largely concerned with retrieving in midair film canisters – about the size of a garbage can – that had been ejected from some of the United States' earliest spy satellites, including Corona, Hexagon and Gambit. These canisters were among the first objects sent into space that were designed to survive reentry. Upon entering the ionosphere, they could resemble a shooting, or falling, star; thus the unit's motto "To Catch a Falling Star."

Because retrieval occurred over water in the Pacific, rescue swimmers were a standard part of the mission crew. Thus, when the 6594th was not

[62] http://en.wikipedia.org/wiki/6555th_Aerospace_Test_Group#Titan_IIIA.2FC_.281961.E2.80.931982.29
[63] The Cape: Military Space Operations 1971–1992 by Mark C. Cleary, Chief Historian 45th Space Wing Office of History 1201 Minuteman Ave, Patrick AFB, FL 32925

busy with their primary mission, they were often available to support the Coast Guard and other agencies in Search and Rescue (SAR) missions. The 6594th Test Group had one of the best records for open water rescues in the Air Force.[64]

Shuttle Transition

Launch had matured from the early failures of the early 1960's to a very reliable part of the overall space systems by the late 1960's. During the mid-1970's, the nation decided to focus its launch capabilities upon the Space Transportation System (STS – the Space Shuttle). As such, in accordance with the Shuttle-only national policy, the NRO redesigned their satellites to be compatible with the Shuttle.

SP-16's integration role became more complex as the Shuttle program experienced delays, the costs grew, and launch rate and performance capabilities could not be met. Additionally, the Atlas, Delta, and Titan production lines were preparing to shut down. A major national policy battle developed between the Air Force and NASA when the NRO and the Air Force developed a strategy to procure 10 additional heavy-lift expendable launch boosters to complement the Shuttle in the early 1980's. This assured-access-to-space strategy was eventually approved by President Reagan in February, 1985. The Challenger accident a year later had a major impact on NRO programs. Post-Challenger Shuttle capabilities included cancellation of Vandenberg launches. The cost of redesigning satellites to fly the Shuttle, then redesigning them again to move back to expendable rockets was extremely high. Through this turbulent period, SAFSP-16 led the NRO effort in coordinating with NASA and Space Division.

Mission Assurance

As a result of the Challenger failure, many NRO satellites moved back to conventional rockets. Then in the mid-1980's, unrelated to Challenger, two Titans experienced different failures with NRO satellites aboard.

Rich Wendt

After these three failures it was clear that we could not expect any replacement or new satellites any time soon. At a Dining Out in Sunnyvale

[64] http://en.wikipedia.org/wiki/6594th_Test_Group

in 1990, Colonel Molvar talked about the difficulty of shepherding aging systems while preparing for new ones.

The failures led to aggressive Mission Assurance programs through Space Division and their contractors – Lockheed Martin, General Dynamics, Boeing, and later, ULA (United Launch Alliance). These independent efforts were undertaken by SP-16 to analyze the designs and implementation approaches of the interfaces between each satellite and the rocket.

To ensure complete data builds for each launch vehicle, SP-16 also conducted independent reviews with their contractors and these Mission Assurance efforts matured over time. Through 2014, the National Security Team has an unprecedented string of launch successes, a direct consequence of earlier Mission Assurance efforts.

In the end, though, launch is still "rocket science," and Mission Assurance remains the watchword as the best way to guard against catastrophic failures.

Nate Lindsay

The only natural predator of a spacecraft is a launch vehicle.

Manned Spaceflight Engineers (MSEs)

During the period when the NRO was preparing to fly all of its satellites on the Space Shuttle, SAFSP developed a "Manned Spaceflight Engineer" program. Volunteers were sought and screened and in 1979, 13 MSEs were selected to undergo specialized training with the NRO, the Air Force, and NASA.

The MSE program was expanded to include Space Division programs as well with the addition of 14 additional MSEs in 1982, followed by 5 more MSEs in 1985. When the second group of MSEs came on board, they became SP-27.

Jack Kulpa

NASA was caught by surprise when they learned that we had women as MSEs. It wasn't long after that when they announced they had added women as astronaut candidates.

These officers were assigned to satellite program offices and it was planned that they would fly as payload specialists on Shuttle flights. The first DoD program scheduled to fly on the Shuttle manifest in FY1982, 82-1, began in 1979 as an SAFSP program, designated Air Force Program 269, and was assigned to STS flight 18. In 1980, the program was restructured into a joint SAFSP / Space Division program. The Air Force Secretariat directed that in spite of the restructure and the continuing slip of the Shuttle schedule, the program was to hold the original launch date since it was serving as a pathfinder for all NRO and Air Force missions to follow. The spacecraft pallet used residual SAFSP hardware and was flown out of a SAFSP mission control center at Sunnyvale AFS. The small joint SPO used several of the MSEs in full-time positions in systems engineering and ground and flight operations. Additional MSEs supplemented the flight team during real-time operations. 82-1 flew in mid-1982 on STS-4, the final Shuttle test flight. Since STS-4 was the last Shuttle test flight, it was manned by a two-man NASA crew with no accommodations for an MSE or other flight crew-members.

Prior to the cancellation of the MSE program (after Challenger), two Air Force MSEs flew on the Shuttle supporting national security missions. Gary Payton, SAFSP (STS-51C, January 1985), and William Pailes, Space Division (STS-51J, October 1985), flew as payload specialists.

Colonel Charles E. “Chuck” Jones, selected as an MSE as a Major, was killed on the American Airlines flight from Boston to Los Angeles that crashed into the Twin Towers on 9/11. There is a memorial to him in the Lobby of NRO Headquarters in Chantilly, Virginia.

CHAPTER 4: SAFSP RECONNAISSANCE SATELLITES

There were frequent false starts, failures and frustrations in the early days of reconnaissance satellites. The embryonic mission required extremely complex systems to operate in a hostile environment with performance specifications that had never been attempted. Many early concepts were developed to respond to urgent national requirements. However, the embryonic technologies continued to puzzle the best minds. Chapter 4 covers six of the early SAFSP reconnaissance projects. Taken together, they serve as a template for success in future high-priority programs of national interest:

- SAMOS – The template that would be used for future SAFSP programs
- CORONA – The first imagery satellite system with significant intelligence to national leaders
- Gambit – The first wholly-owned SAFSP satellite, Gambit's stunning resolution led to urban legends about being able to read license plates from outer space
- P-35 / 417 / DMSP – A weather satellite designed to support Corona
- Quill – An early radar program that was considered by the DoD to have great potential
- Hexagon – After a difficult birth, Hexagon redefined the term "wide area search"
- …and several other remarkable programs still classified

SAMOS

The SAMOS Project Office was responsible for all Air Force reconnaissance satellite development:

- The SAMOS satellites were designed for film return as well as real-time film readout and transmission to the ground. Within SAMOS alone, the embryonic organization was trying to develop five different versions in parallel.
- The Army-sponsored Argon[65] mapping system.

[65] HOSR pg 169

- Weather interfaces with TIROS (later leading to SP's own weather satellites)
- Ferret satellites for investigating frequencies around the globe
- And a tenuous connection to Corona (with NSC direction and covert CIA-Air Force management). It took 14 Corona launches before film was retrieved, processed, and shown to the President. Corona's failures reinforced the need for a two-track approach to satellite reconnaissance. SAMOS was considered the principal path while Corona was considered the backup.

Pete Swan

When I teach, I always ask the question, "Why did it take until 1957 before a satellite was successfully launched and operated in space?" The simple answer: "Because it is hard! After all, it is rocket science!"

SAMOS started as an Air Force R&D project and developed rapidly into a robust activity with multiple goals and missions. The developmental goal was to relay film imagery to the mission ground sites for rapid intelligence processing and dissemination for analysis. The film in the first two concepts was processed and then read out with an electronic scanner for transmission to the ground. The next few versions used parachute recovery of film capsules – there were 11 launch attempts (only two partial successes) from 1956 to 1962. Rocket science was really hard in 1958, and it continues to be a challenge even today.

> "Conceived in the mid-1950s, the novel SAMOS represented cutting edge technology – a near-real-time analog film readout satellite. The Eastman Kodak Company built the E-1 (preliminary) and E-2 (advanced) payloads. The E-1 featured a six-inch focal length lens in a camera that spooled a special two-component EKC Bimat (positive) film, and SO243 (negative) film. The exposed negative film, converged with the Bimat gelatin-coated Estar, was developed in a semi-dry chemical process, and then was scanned by a Columbia Broadcasting System flying spot line-scanner that consisted of a cathode-ray tube and a rotating anode having a high intensity spot of light. A photomultiplier converted the light passing from the scanner through the film into an electrical signal whose strength varied with the density of the emulsion layer of the film.

The images were then radioed to Earth and assembled much in the manner of a wire photo, each image built up in swaths."[66]

Payload	Type	Focal Length	Resolution	Swath
E-1	Readout	1.83 m (72 in)	30 m (100 ft)	161 × 161 km
E-2	Readout	0.91 m (36 in)	6 m (20 ft)	27 × 27 km
E-5	Film	1.67 m (66 in)	1.5 m (5 ft)	98 km length
E-6	Film	0.70 m (28 in)	2.4 m (8 ft)	280 km width

Table 1, Key SAMOS Projects[67]

The preferred solution was to leverage a semi-real-time readout system that could significantly reduce the delays in delivering intelligence. However, that technology ran into significant problems, as described below:

> "When launched into a low-Earth orbit in late 1960 and early 1961, however, SAMOS E-1 imaging payloads encountered problems – and not just the normal ones associated with electronic component or launch vehicle malfunctions. Similar to Corona, the E-1 readout payload also was a film-limited system and did not have a long life on orbit. Second, it had no image storage and recall capability, and had to transmit its take to a ground station on the next pass. Third, the images were not encoded; for security reasons that meant the film had to be read-out over the continental United States. Finally, SAMOS, operating at a bandwidth threshold of six megahertz and in view of a ground station for only a few minutes as it passed overhead, would lose part of its reconnaissance take on each orbit. In September 1961, therefore, Charyk terminated the SAMOS film read-out payloads. For satellite imagery in the near term, the NRO would concentrate its efforts on Corona and the other film recovery satellite systems then under development."[68]

An interesting twist occurred when the technologies developed during the E-1 and E-2 projects resulted in major successes; however, on a different body in our solar system and for a different customer:

> "Having acquired, launched, and then terminated work on a near-real-time imaging satellite, however, NRO officials at that time

[66] R. Cargill Hall, SAMOS to the Moon: The Clandestine Transfer of Reconnaissance Technology between Federal Agencies, 2.
[67] http://en.wikipedia.org/wiki/Samos_(satellite)
[68] R. Cargill Hall, SAMOS to the Moon: The Clandestine Transfer of Reconnaissance Technology between Federal Agencies, 2-3.

agreed to consign the SAMOS imaging technology to the National Aeronautics and Space Administration (NASA) for use in its deep space exploration program. The surreptitious transfer of this technology, a fact just recently declassified, has remained unknown to many in the NRO and NASA because of the compartmented security measures then in place.

"The Boeing Airplane Company designed and built a solar-powered spacecraft stabilized in attitude on three axes, installed other off-the-shelf hardware, and integrated it with the modified E-1 SAMOS payload. The space agency launched five of the "SAMOS Lunar Orbiters" successfully between August 1966 and August 1967.

"Program A's…SAMOS secretly helped make possible manned lunar exploration and it became the nation's first near-real-time film imaging system."[69]

The other SAMOS projects were geared for film return and matured inside the environment rapidly, but again, mostly with failures. In many respects, failures in this harsh environment were beneficial in the long run because the program office could learn from each failure and do better the next time.

"Apart from Corona (which had been operational for three years), one Lanyard flight of May 1963 (which produced a few photographs of no great intelligence worth) and the returns from one Samos E-1 mission (with resolution limited to about 100 feet) represented the only successes of a satellite reconnaissance effort that had been in existence for nine years and heavily funded for five. Corona, sponsored by the CIA, was not considered an element of the "Air Force" satellite reconnaissance program, being classified as an "interim" capability system even though developed, managed, and operated mostly by Air Force people. Both the SAMOS E-5 and SAMOS E-6 programs had failed and had been cancelled by the end of 1962 – after eight consecutive mission failures (nine, if the first Lanyard were counted). All told, an effort that very probably cost more than xxx[70] had yet to produce useful photography. Greer's concern for 'one good picture' was all too understandable

[69] R. Cargill Hall, SAMOS to the Moon: The Clandestine Transfer of Reconnaissance Technology Between Federal Agencies, 2-8.
[70] Number obfuscated in the released document.

in those circumstances."[71]

In addition to the technical and operational challenges, the growing complexity of the community was daunting and it became increasingly difficult to sustain the covert, closed, streamlined acquisition process that had been the watchword. The following excerpt from a declassified and released top secret document illustrates the issues at the time.

> "One of the significant results of the NSC review of the national satellite reconnaissance program last August [1960] was the placing of the SAMOS project under a special streamlined management set-up. From my close observation of the results, it is clear that this was an important step in the right direction. However, personnel changes and policies which have been established in closely related areas since that time are seriously threatening undesirable expansion of this management structure with consequent dilution of authority and expansion of personnel who have knowledge of these highly sensitive matters. It is imperative that a new understanding be established immediately concerning the management of the entire national satellite reconnaissance effort.
>
> "In the NSC review of August 1960, both the overt SAMOS and the covert Corona projects were considered, although access to information on Corona was greatly restricted, of course. The resulting management change consisted in placing the SAMOS project under a streamlined management structure centered in the office of the Secretary of the Air Force. No outward change was made in the cover aspects of Corona but the Air Force management responsibilities for the covert aspects (vehicles and launch schedules) were also centered in the office of the Secretary. The overt SAMOS project was removed completely from normal channels, with ARDC HQ [predecessor to Air Force Systems Command], the Air Staff, and the OSD staff completely removed from reviews and approvals of this project. Management lines were established as direct to and from the Director of the SAMOS project in the field (General Greer), the office of the Secretary of the Air Force (Under Secretary Dr. Charyk), and the office of the

[71] "History of Satellite Reconnaissance," in the *Perry Histories Volume IIb*, 192.

Secretary of Defense (Mr. Douglas). The Deputy Secretary of Defense became the actual point of contact for Charyk; Douglas delegated the assignment. Key personnel outside these channels were periodically informed of the program status; all elements outside these channels were required to support this project as and when required by this management structure."[72]

Corona

Editor's Note: The primary source for this abbreviated history of Corona is the Smithsonian History of Aviation Series book "Eye in the Sky: The Story of the Corona Spy Satellite," edited by Dwayne A. Day, John M. Logsdon and Brian Latell.

The Corona Program, a foundation for our nation's overhead reconnaissance program, achieved major milestones in space system technology and program management. Corona XIII returned the first object from orbit, its Agena upper stage demonstrated the first three-axis stabilized spacecraft, and Corona pioneered the development of films suitable for space. Corona management techniques, evolved from those used on the U-2 program, established the baseline for SAFSP's streamlined management culture. More importantly, Corona produced intelligence that enabled major new directions for our defense efforts. The first successful Corona, Corona XIV, provided more coverage of the Soviet Union than had all 24 U-2 missions combined. Corona went on to prove that, yes there was a Missile Gap, but it was dramatically in our favor.

In 1954 President Eisenhower established the Technical Capabilities Panel, headed by James Killian, to address the possibility of a Soviet first strike. One of the Panels, headed by Edwin Land focused on strategic intelligence. The first result of the Killian Panel was the U-2 overflight program. The planned Air Force response to the need for overhead reconnaissance was WS-117L, a 92-satellite program planned in seven phases, with the first phase a direct readout satellite that processed the film on-board and transmitted the images to the ground. With the launch of Sputnik the pressure increased for satellite reconnaissance and the new President's Board of Consultants on Foreign Intelligence Activities (PBCFIA), again chaired by James Killian, urged a major review of all reconnaissance programs. The PBCFIA doubted that direct readout

[72] Special Concern Management SAMOS, 1.

satellites could return imagery on the scale required. Killian and Land urged the President to start a program to use returnable film capsules and the management model developed for the U-2 which Richard Bissell of the CIA managed with Air Force General Ozzie Ritland as his deputy.

Bissell directed the overall program and managed the CIA portion of the work while Ritland directed the Air Force portions of the program. Bissell wrote of Corona's program management:

> "The program was started in a marvelously informal manner. Ritland and I worked out the division of labor between the two organizations as we went along. Decisions were made jointly. There were few people involved and their relations were so close that decisions could be made quickly and cleanly."

General Ritland organized the Air Force component of Corona in 1958 as a program office in Los Angeles headed by Col Lee Battle and, initially, comprised of three officers (Roy Worthington, Frank Buzard, and Bill Johnson). The CIA provided funding, security, cameras, and the recovery vehicles while the Air Force provided spacecraft, launch vehicles, and the retrieval of the recovery vehicles.

The initial configuration for the film recovery spacecraft, called Program IIA, had been under development as part of WS-117L. IIA was a spinning satellite with a 12 inch focal length camera and aerial recovery of the film. Techniques of aerial recovery had been perfected during the Genetrix balloon program. The Corona management team evaluated, and quickly selected, a camera approach proposed by Itek Corporation based upon scaling up the 12 inch focal length HYAC camera used on the Genetrix to a 24 inch focal length (2,500 of the HYAC cameras were built for Genetrix). Frank Madden was the first Itek manager for the Corona camera. This decision to use the Itek design significantly complicated the requirements for the Agena upper stage/spacecraft as it now had to maintain its attitude in three-axes with active attitude control to an accuracy of 0.2 degrees. The attitude control subsystem used gyros, infrared horizon scanners, cold gas jets and augmented them with horizon, star and framing cameras to record the vehicle's attitude for later use in reconstructing the exact attitude of the vehicle. Jim Plummer was manager of the Lockheed effort which included the Agena. The Thor IRBM was selected as the launch vehicle and General Electric was selected to provide the recovery vehicle.

The Corona program started on 28 April 1958 and met the two milestones established at the beginning of the program by freezing the design within two months and making the first launch attempt within 10 months. A test flight of the Thor with an Agena as an upper stage was planned for January 1959 but a short circuit and a malfunction resulted in destruction of the Agena. Failure analyses concluded that the systems integration testing was inadequate. This conclusion led to extensive pre-launch testing of all future Corona vehicles.

The first Corona I launch attempt was on 28 February 1959. The vehicle carried a light engineering payload and no camera or film. After launch it was never heard from again. "Buzz" Buzard, Lee Battle's operations officer, concluded that the Agena stage had malfunctioned. On 13 April Corona II, carrying a mechanical mouse, was launched but capsule recovery failed. The conclusion was that a human programming error had resulted in the capsule ejecting early and that the capsule had landed somewhere around the Norwegian island of Spitzbergen, an incident that inspired the movie "Ice Station Zebra." On 3 June Corona III launched with four mice but the Agena misfired and plunged into the Pacific Ocean. Corona IV, launched on 25 June carrying a C-model camera, but it never reached orbit due to another Agena failure. Corona V reached orbit with a C-model camera but the camera failed due to low temperatures. Telemetry indicated no film ever reached the recovery vehicle. To cap the mission, the deorbit burn resulted in a retro rocket that fired upward resulting in the recovery vehicle going to a much higher orbit with an apogee of 1,058 miles. Corona VI launched 19 August and the camera failed on the second orbit, probably due to film breakage. Corona VII launched on 7 November but the Agena failed to inject it into orbit. Corona VIII launched on 20 November but no film went through the camera and the recovery vehicle disappeared after separation. In the same time period as Corona VI, VII, and VIII investigations on the ground proved that the acetate-based film was "crumbling" in the near vacuum of space, a result not expected as the acetate film had been used on the Genetrix program that operated at 80,000 feet. Eastman Kodak solved the film problem by getting a license from DuPont to produce a polyester film base.

Following the failure of Corona VIII a 2½ month stand-down was directed by program management to correct the wide range of engineering problems. On 4 February 1960 Corona IX was launched

with the new polyester film but the Agena failed to achieve orbit. Corona X was launched on 19 February 1960 but the Thor had guidance problems and had to be destroyed. Corona XI launched on 15 April and the camera operated successfully with the new acetate based film. However, the spin rockets exploded during the recovery sequence and the capsule was not recovered.

Another stand-down followed to implement a new cold-gas spin subsystem and program management decided to fly the next two vehicles without cameras but heavily instrumented to evaluate the new cold-gas spin and de-spin subsystem. On 1 May, during the stand-down, Gary Powers' U-2 spy plane was shot down over Siberia and President Eisenhower suspended U-2 over flights. Pressure on the Corona team ratcheted up as it was clear that Corona was the last best hope to fill the critical gap in our strategic intelligence. Corona XII was launched on 29 June 1960 but failed to reach orbit due to an Agena problem. Corona XIII, the second instrumented test flight, launched 10 August 1960. The new cold-gas spin/de-spin subsystem worked as designed and the recovery vehicle re-entered but the recovery aircraft had been sent in the wrong direction and the capsule was picked up from the water by the Navy. The Corona XIII capsule was the first object ever recovered from orbit and the American flag, the only cargo in the recovery vehicle, was presented to President Eisenhower.

Overall, Corona I to XIII launches included five Agena failures to inject the vehicle properly, five recovery vehicle failures, an erroneous Agena burn, a Thor failure and the successful recovery from the ocean of Corona XIII. Eight of the missions had carried a camera with the other five designed as test vehicles. The disheartening string of failures extended over 17 months.

Eight days later, on 18 August 1960, Corona XIV was launched with a camera. The system performed as designed with the capsule being recovered in the air by a C-119 flown by Capt Harold Mitchell. The film load was only 20 of the planned 40 pounds, but the mission returned photography of more denied area than the entire 24 flight U-2 program. The photo-interpreter found 64 new Soviet airfields and 26 new surface-to-air missile sites in the imagery. While Corona XIV disclosed multiple new Soviet sites, many of the photo-interpreters returned to their U-2 photography for detailed intelligence gathering such as counting bombers. Hence, Corona program management

concentrated on efforts to improve many parameters of the photography, particularly the ground resolved distance (GRD) from the initial GRD of about 35 feet. The first camera improvement to the C' configuration added image motion compensation so that different orbits could be flown; however, the first two Coronas with image motion compensation were not successful. Corona XVIII, launched on 7 December 1960 and was successful. It provided improved GRD photography of about 25 feet. At about the same time the Agena B increased its fuel load, provided a restart capability for longer duration flights, as well as the capability to alter its orbit significantly to optimize intelligence collection. The next improvement to the camera, the C'', changed the lens assembly from the initial Tesar f/5 to the Petzval f/3.5 and provided vibration reduction that improved GRD in the 12 to 25 feet range and was first launched by Corona XXIX (Mission 9023) on 30 August 1961. The Mural configuration added a second camera, C''' configuration, to provide stereoscopic photography that enabled photo-interpreters to perform "mensuration" (determine the precise geographic location) of the intelligence targets.

The next major change to the Corona camera system, J-1, added a second recovery vehicle. The J-1 configuration was first launched on 25 August 1963, but only the first capsule was recovered after four days on orbit. The final change to the Corona camera configuration, the J-3, added a constant rotator feature that further reduced vibration and resulted in GRDs of 6 feet. The first J-3 was launched on 15 September 1967 and the first capsule was recovered after six days with the second capsule seven days later. The changes to the spacecraft were enabled by launch vehicle improvements such as the addition of three solid rocket motors for the Thor to produce the Thrust Augmented Thor (TAT), and the use of the Agena D that had larger fuel tanks. The first Agena D was launched on 28 January 1962. Continuing improvements to the Agena resulted in flight durations that improved from one day for early Coronas to 19 days by the end of the program.

Throughout the Corona program Eastman Kodak continued developing better film and by the J-3 configuration the film resolution had been improved from 50-100 to 160 lines/mm. Color film was tried but its reduced resolution was not well received by the photo-interpreters. Infrared false color was also used and spawned an interpretation effort related to geology and agriculture. Eastman Kodak

developed and introduced ultra thin-based films that increased the area coverage by 50%.

Before Corona the geographic position of many locations within denied territories were known to accuracies of no better than 30 miles, not nearly adequate for targeting, even using thermonuclear weapons. Beginning with the first Argon, a Corona version with mapping cameras for the Army, and then by the improvements to Corona, the United States' Mapping, Charting and Geodesy (MC&G) capability was improved to provide accuracies of 400 feet in the horizontal and 300 feet vertical. Many points were located to 150 feet in the horizontal. The MC&G capabilities derived from Corona photography not only supported all U.S. targeting efforts but also provided the maps and geodesic information necessary for the planning of military operations worldwide.

By September 1961 the benefits of Corona were reflected in National Intelligence Estimate 11-8/1-61 that showed the Soviets, far from having scores of ICBMs, had only about six while the United States was pressing ahead with Atlas and Titan ICBM, was developing the solid-fueled Minuteman and planned to put ICBMs onto submarines. Before Corona, the Air Force proposed deploying 10,000 Minuteman ICBMs. With Corona data in hand, Kennedy's Defense Secretary Robert McNamara cut that force to 1,000.

Through its operational lifetime Corona contributed photography to crisis intelligence assessments of the Russian deployment of missiles to Cuba, the six-day war in the middle east, and the invasion of Czechoslovakia. President Johnson began discussions with the Soviets on strategic arms control based upon Corona data. Richard Helms, the Director of Central Intelligence at the time, remembered President Nixon telling him, "If you can't verify an arms control treaty, we're not going to hold any arms control negotiations." Helms discussed the need for mutual verification and the negotiators needed to match our figures with the Soviet figures. After some discussions, the Soviet negotiators agreed to use the U.S. projections for Soviet forces that the U.S. had compiled using Corona photography. The resulting ABM treaty and the Strategic Arms Limitation Agreement were signed by President Nixon in 1971.

Through the entire program Corona exposed 2.1 million feet of film and photographed a total of 557 million square miles (the denied area of the

Sino-Soviet bloc was about 11 million square nautical miles). A total of 137 vehicles flew with cameras and returned 167 recovery vehicles.

Lee Battle's successors included Roy Worthington, Paul Heran, Charlie Murphy and Gene Gopert, the last SPO Director. Among the personnel in the latter phase of the program were B. D. White, Chief of Engineering; Frank Wright, Chief of Operations; and Barnie Burnett, Chief of the Payloads Division.

Gambit

In the fall of 1960, active SAMOS projects began transferring out of BMD and into SAFSP's black world (SAMOS R&D projects stayed in SMD's white world). At that time there was to be a competition for the follow-on (black) SAMOS E-6 system. As the E-6 procurement proceeded, a new design surfaced from Eastman Kodak: a 77-inch camera with very good ground resolution. Leveraging past developments of launch vehicles, spacecraft and reentry capsules, SAFSP initiated the Gambit program on 13 August 1960, with Bill King[73] as the first SP Program Director.[74]

> "E-6, initially [code-named] BLANKET, was a component of the WS-117L / SAMOS project that became Gambit. Initiated by SAFSP in 1960, it was intended as a film-return search system with capabilities beyond Corona."[75]

Gambit was the first major photoreconnaissance satellite started inside the new Air Force field office in Los Angeles. Gambit started with R&D inside the BMD's SAMOS office, was approved for development as SAFSP was forming, and then developed into an operational "close look" / surveillance system during the early days of SAFSP. The program's unusual path to first launch exemplifies the SP culture of streamlined management, covert activity, empowerment, and knowledgeable professionals:

> "Following final launch preparations, which included an elaborate deception scheme worked out by Colonels Ruebel and Pletz, Major David Bradburn, and Lieutenant Colonel Ralph J. Ford, the first Gambit was launched at 1344 hours Pacific Daylight time, on 13

[73] Colonel Que Riepe led the Gambit SPD when it was part of Space Division SSZX in 1962.
[74] The Gambit Story, 17.
[75] Perry, Gambit, pg. 277.

> July 1963, just 22 months and 17 days after the National Security Council decision to proceed with development of a 'covert' alternative to SAMOS."[76]

As described in "The Gambit Story," the initiation of the Gambit program was literally at the same time as the initiation of SAFSP:

> "Within 24 hours of receiving the Kodak studies and summary proposal [for Gambit], the Space Systems Division (predecessor to today's SMC) began processing a letter contract. About the same time, responsibility for the SAMOS program was transferred from the Space Systems Division to the newly-created Secretary of the Air Force SAMOS Project Office, which subsequently became the Secretary of the Air Force Special Projects Office (SAFSP). The office's military director, Brigadier General Robert Greer, had been transferred to Inglewood, California."[77]

In parallel with SAFSP's development of Gambit, the intelligence requirements grew tremendously, from successes. The National Intelligence Estimate (NIE) in September, 1961, significantly reduced the estimated number of Russian ICBMs from "hundreds" to between 10 and 25. The so-called Missile Gap did not exist. This new insight was due to the success of the Corona Photo-Search satellite system fielded in 1960. Its area-coverage and resolution were designed to photograph large ground areas with sufficient resolution to find and count the missiles and launch sites and allow Intel-analysts, for the first time, to accurately assess the threat. However, there were other Intelligence needs that far exceeded Corona's capabilities. The ability to discern the length and Diameter of Ballistic and Surface-to-Air Missiles within inches and the armor thickness and artillery caliber on tanks, to determine their performance and vulnerabilities was essential to configuring the arms and strategies to counter them. Once the weapons and forces were found (Corona), higher resolution photography was required. This was the genesis of the growth of Gambit capabilities.

Hank Stelling

I recalled that when someone asked Program Manager Bill King about the origin of an unclassified name for the Gambit mission, "Pine Tree," he

[76] Hexagon (KH-9), Mapping Camera Program and Evolution, Center for the Study of National Reconnaissance Classics, April 2012, 117.
[77] The Gambit Story, 17.

replied in an off-handed manner that they urgently needed to bring back a high-resolution image, even if it was a picture of a pine tree.

Gambit flew the largest space telescope that existed at the time, which led to a very productive spacecraft program. Gambit exceeded expectations on its first mission (July, 1963) as it successfully orbited 18 times, delivered over 190 feet of film, and achieved best images at 3½ feet ground resolution.[78] This program became a major supplier of precise photographic intelligence to the Nation. The system performed remarkably well during national crises and was replaced by a more advanced concept, Gambit Cubed. The second Gambit program (1963-1984) was a core SAFSP success as well as a national asset worthy of a Smithsonian display.[79]

Thus, in early 1961, there were seven reconnaissance programs in development: two readout (E-1, E-2) and five recoverable capsule (E-4, E-5, E-6, Lanyard, and Gambit). There were also two mapping systems and two ferret systems. In parallel, Corona and Mural (a two-camera stereo system derived from Corona) were progressing rapidly in a different chain of command, but residing under Dr. Charyk's direction.[80]

> "Gambit was the first operational American satellite system to return high-resolution photography. Originally designed around a lens of 77-inch focal length to produce photographs with ground resolutions of two to three feet, the Gambit was boosted to orbit by an Atlas-Agena. The camera was housed in an orbital control vehicle built by General Electric, an innovation in photo-satellite design intended to overcome the assumed stability shortcomings of the Agena. The camera was an Eastman Kodak product; the recovery capsule was adapted from one first developed by General Electric for Corona. Operational use of the original Gambit system began on 12 July 1963, and continued until 4 June 1967. During that time 38 vehicles were launched (KH-7). The successor surveillance satellite in the National Reconnaissance Program was Gambit-3. By 1973, the Gambit program had moved into its fourth generation – Gambit-1, Gambit-3, the double-bucket Gambit-3, and

[78] The Gambit Story, 41.
[79] The first declassified Hexagon and Gambit satellites were delivered to the Air Force Museum for display after a quick show at the Smithsonian, Udvar-Hazy location.
[80] "History of Satellite Reconnaissance," in the *Perry Histories*, 125.

the "Block III" Gambit-3 (58 KH-8 launches).[81] The newest satellite rolled the entire vehicle to photograph targets off the direct flight path. Resolution at the earth's surface was the greatest ever achieved. It could resolve images XX nautical miles on a side and from YY nautical miles in height – a feasible operational altitude – it was expected to resolve targets less than ZZ on a side. The achievements of the Gambit program from its inception in 1963 to 1973 were varied, significant, and in many cases, dramatic. One that was often overlooked was cost. Although Gambit photography improved in resolution from three feet to less than QQ over those years, the photographs themselves became less expensive by several orders of magnitude."

(Note: The values represented by XX,YY, ZZ, and QQ are still sensitive and not releasable – or in their verbiage, REDACTED.)[82]

The actual flight results were released in a staff summary sheet from SP-2 to SP-1 Gen Martin (24 Aug 1967):

"The contract specification for Gambit ground resolution was 2-3 ft (135 lines/mm). The total take of any single mission contained photographs with a variety of resolutions because of flight and ground conditions. Considering only the best resolution obtained on any flights, the results of the 36 missions achieving orbit may be tabulated as follows:"

Resolution	***Number of Flights***	***%***
Better	*4*	*11.1*
2 to 3 ft	*21*	*58.3*
3 to 10 ft	*3*	*8.3*
Worse than 10 ft	*7*	*19.5*
Not recovered	*1*	*2.8*

Two additional Gambit-1 vehicles were produced but never flown. With the advent of the newer version (Gambit 3) it was decided to long term store them (Project VanWinkle) for future use or display. With the program declassification in 2011 both have been removed from storage

[81] KH-7 was Gambit 1; Gambits 2, 3 and 4 were all proposed to replace it. G2 had less modifications, but offered a less significant increase in resolution, G3 featured more changes and gave higher resolution images. G4 would have given the highest resolution. Only G3 was developed, and it became KH-8. http://forum.nasaspaceflight.com/index.php?topic=26821.0

[82] "History of Satellite Reconnaissance," in the *Perry Histories, Volume IIb*, 315.

and are now on display at the Smithsonian Air & Space Museum in DC and at the Museum of the Air Force in Dayton.

Hank Stelling

When Bill King (the second Gambit Program Manager) briefed Dr. Charyk (DNRO) about the 50% mission failure rate for Gambit, Dr. Charyk's response reflected the importance of the program: "Launch twice as many!"

Bill quickly replied, "Oh, no! We have to fix the problems first."

On 17 April 1984, the last of the Gambit vehicles was launched from SLC-4W at VAFB and ended 118 operational days later with a fiery de-orbit into the Pacific. A fitting tribute to a magnificent program, the last of the high-resolution "photo birds."

Gambit was developed inside SAFSP, flown by SAFSP and terminated during its tenure inside SAFSP. As such, this was the first really successful photo reconnaissance satellite "owned" by SAFSP. Coupled with Corona, this program's success ensured that valuable intelligence was provided to the highest levels of the government.

P-35 / 417 / DMSP

> "In 1961, Charyk authorized the NRO…Air Force office [in Los Angeles] to begin work on a meteorological satellite that would fly ahead of NRO imaging satellites and assay the cloud cover over the Eurasian land mass. Pictures of clouds retrieved from a film-limited spacecraft cost dearly – a fact made plain in 1960-61 by the return from early Corona missions. A small group of Air Force officers modified a Tiros experimental satellite for operational use, integrated it with a new booster, and beginning with the first successful launch in August 1962, advanced the technology so well, so quickly, and so inexpensively that the Commerce Department adopted the NRO version for its own meteorological purposes in place of the Nimbus weather satellite on which NASA had been working to meet the needs of all government agencies."[83]

[83] R. Cargill Hall, "A History of the Military Polar Orbiting Meteorological Satellite Program," in *Quest: The History of Spaceflight Quarterly, Vol. 9, No. 2 (U)* (2002).

Tom Haig

Program 417 built its own ground stations and control center, turned them over to SAC and created the first operational U.S. satellite system. Our first successful launch was the world's first operational meteorological satellite.

In A History of the Military Polar Orbiting Meteorological Satellite Program, by R. Cargill Hall (September 2001, Office of the NRO Historian), the P-35 program is described as a remarkable achievement in both technical performance and programmatic innovation.[84] Then-LtCol Tom Haig led a small team of SAFSP personnel and changed the whole concept of how to achieve the results needed. He successfully provided a capability that was of national importance to the NRO, to the tactical and strategic arenas of the DoD, and to the civil weather community. The following excerpts from Cargill's document capture the fast-paced, small program office's success, and suggest an approach for meeting highest national interest projects of the future.

> "On 21 June 1961, Charyk spoke with Major General Robert E. Greer, Director of the Office of the Secretary of the Air Force for Special Projects (SAFSP) in El Segundo, California. He asked Greer to prepare a "minimum" proposal for four "Earth-referenced" wheel-mode weather satellites to be launched on NASA Scout boosters. Greer responded with a 22-month program for a small fixed budget and with a first launch in ten months. The Deputy Secretary of Defense approved it, and the Director of Defense Research and Engineering, Harold Brown, made the funding available. On 27 July 1961 Greer's deputy, Colonel Harry Evans, appointed Lieutenant Colonel Tom Haig the first director of the Defense Meteorological Satellite Program (DMSP). Haig, a meteorologist and electrical engineer, accepted the assignment on condition that he would not have to use the resident "systems engineering and technical direction" contractor, could select his own small staff, and could use fixed-price, fixed-delivery contracts under his direct control throughout the program. Evans added a "kill switch" of his own: if the first launch could not be met on schedule or if costs appeared certain to exceed the fixed budget, he instructed Haig to terminate the program and recover

[84] P-35 was subsequently called Program 417 before becoming DMSP

government funds immediately without further direction.

"In the months that followed, the DMSP effort operated on NRP funds under the NRO security blanket, but located physically outside the NRO Special Projects Office in El Segundo for purposes of cover and ease of operations. Haig divided the work among those he initially selected: three officers and Renell LaBatt, "a very busy secretary." He invested his own time in program management, with special attention paid to a contract he negotiated with RCA for the weather satellite. Captain Stephen Dvorchak (joined later by Captain Richard Geer) was assigned the Scout launch vehicle: a small, four-stage, solid-propellant rocket built by Chance Vought and procured under NASA direction. To meet performance requirements, Dvorchak substituted a high-acceleration Lockheed Propulsion Company MG-18 solid-propellant motor in place of the standard Scout fourth stage Altair motor. Captain Luin Ricks handled ground support, tracking, command, and readout at the Air Force ground stations. Finally, Major Charles Croft oversaw contract management at the various firms involved, using novel contracts that were "fixed price" instead of the customary "cost plus fixed fee." The RCA fixed-price, fixed-delivery contract proved itself in December 1961, when a major structural member of the weather satellite, the base plate, failed during tests and company officials requested a three-month delay for redesign. Croft, after discussion with Haig, advised RCA that it had ten days to produce a fix or the contract would be terminated under procurement regulations "at no cost to the government." The RCA program manager appeared three days later with revised internal schedules that met the original launch date."

LtCol Tom Haig,
First DMSP Program Director

Tom Haig

My program was not organizationally a part of SP. It was supposed to be a one-year program and then quietly disappear, but the National Weather Service was unable to meet NRO needs, so it continued as a bastard

program, funded by NRO but never formally integrated into the NRO organization. As far as I know, at least during the first three years, no one in the CIA even knew of its existence. My relationship with SP was severely limited. My reporting line was through General Greer to DNRO, but when I called General Greer before I took my charts to the monthly visit in Washington, Greer usually said, "I don't want to hear the briefing. If something happens that's important in Washington, tell me about it when you get back."

Jack Kulpa

417 was a fabulous program to work on. I had four bosses: DNRO Al Flax, Air Force Systems Command commander General James Ferguson, the Space Division commander LtGen Jack O'Neill, and SP-1 General Martin. Each of them thought one of the others was running it. Never had so much fun.

Don Thursby

Most programs delivered their spacecraft to VAFB by air-ride van or flew them in. Program 417 mailed their 150-pound satellite via U.S. Postal Air Express, armed guard required. One of my duties was to fetch the arriving spacecraft at LAX. Early afternoon the day before, I would receive a call with the flight number and arrival time. Getting the Wing Commander's rusty dusty .38 revolver from the bottom safe drawer, I would absorb his parting instructions: "Son, I am giving you one bullet which you will keep in your breast pocket throughout your trip. Understood?" Over to the Base motor pool to sign for the last Air Force blue pickup truck on the lot, always with less than half a tank of gas and tires recapped not less than seven times.

At 0300 hours depart for LAX Air Freight Terminal to meet an armed Postal clerk and the arriving aircraft. On the drive back, always wondered what would happen if a thread-bare tire blew out, I swerve, and the round white container pops out and rolls down the hill, across the beach and into the ocean. I could see the headline news: "Secret Air Force satellite hits local beach, sinks in surf."

Quill

"Quill was the world's first imaging radar satellite, launched by the National Reconnaissance Office (NRO) as an experiment in 1964. The NRO was young then – only a year old, in fact, when Quill's

> development got under way. But several dominant traits were already apparent: dedication to developing very advanced technology, aversion to bureaucratic management, and irresolution in the face of competing military and national intelligence needs."[85]

Ideas were plentiful in the early stages of satellite reconnaissance. Many people imagined taking missions accomplished by aircraft and moving them to space as a natural progression. The idea of taking a radar sensor off an aircraft platform and placing it on a spacecraft was intriguing. SAFSP initiated a program to do just that.

> "In 1964, the National Reconnaissance Office (NRO) – in the secret world of its then highly classified Byeman Security Control System – conducted what has become known as the Quill experiment. This experiment resulted in another first for the NRO – the collection of radar imagery from space. This took place fourteen years before the National Aeronautics and Space Administration (NASA) conducted its 1978 short-term SEASAT mission as a proof-of-concept for the use of radar remote sensing for ocean studies. The Quill experiment also took place almost 30 years before the emergence of regularized space-borne radar imaging for the remote sensing community with missions such as the European Space Agency's ERS-1 in 1991 and the Canadian Space Agency's RADARSAT-1 in 1995."[86]

The dramatic needs of the time forced the space community to push technology. Quill was one of those missions that had significant support from outside the Intelligence Community because it was perceived to be a warfighting capability as well as a collector of intelligence. The Strategic Air Command supported this satellite, believing it could assess bomb damage in denied territories and assist in tactical and strategic planning in semi-real-time. The system was designed to have both film return and near-real time readout. The key to this mission was its all-weather, day/night collection of intelligence – unique strengths of radar imagery.

> "The NRO originally developed Quill to test the concept of using a satellite to capture radar returns and create imagery of targets

[85] Robert L. Butterworth, "Quill: The First Imaging Radar Satellite," NRO, Dec 2004, v.
[86] Quill, ix.

> bombed by the Air Force as a result of military action. It was characterized by the Air Force as an 'offensive' system to assess the effectiveness of military operations, rather than an intelligence system to gain insight into denied areas of the capabilities of the U.S. adversaries."[87]

To put it simply, "SAC wanted a satellite-borne, post-strike, all-weather assessment capability in near-real-time."[88] In June 1962, the DNRO directed General Greer to evaluate the potential of such a system. A six-person team reported that it was possible, and then-Major Dave Bradburn was authorized to proceed.

The November 7, 1962 decision included two significant points: 1) the program would be a demonstration of capability, and 2) Major Bradburn would be in charge (as program manager) and report directly to Charyk. The era of procuring major NRO satellites using direct reporting and limited oversight, begun in 1958 with the start of Corona, had shifted into high gear.

During the development of the system, SAFSP was having growing pains and financial overruns with some of its programs. The space business is hard and pushes teams to extremes when handling challenging missions. In the Quill case, Greer and King strongly supported the management approach given them by President Eisenhower: give the high priority project to a one star reporting directly to the highest levels in the land, have small teams, empower them, fund them and get out of the way. This became SP's code of conduct for the duration of the organization's existence.

> Colonel King and Major Bradburn had…"the conviction that high technology programs entrusted to large management groups with complex reporting channels were sure to overrun. Quill and the P-35 weather satellite program were the first SAFSP undertakings which conformed to the Greer-King philosophy, although Gambit was reconfigured into that model" by Col King as the Gambit program manager.[89]

[87] Quill, xviii.
[88] Quill, 2.
[89] Quill, 8.

Using SAFSP's streamlined management techniques, the experiment recorded and recovered analog radar imagery that was initially very difficult to interpret. A comprehensive research effort followed in which SP-6 eventually solved a wide range of interpretability problems. The schedule of the program was rapid and challenging:

> Fall 1961: Initiate study of radar satellites
> June 1962: DNRO evaluates proposal for program
> November 7, 1962: DNRO approves program
> December 21, 1964: Launch two years after program go-ahead
> December 26, 1964: De-orbit and return bucket of film
> January 11, 1965: Satellite de-orbits

Approximately 70,000 square miles of radar imagery was collected by Quill. The success of the mission and the Quill program was summarized by General Greer:

> "The flight of the satellite, when it came in December 1964 was almost anticlimactic. So close was the system performance to that determined in tests, so nominal was the operation, so professional was the handling of the satellite by the Satellite Control Facility, (that) a participant had to remind himself that this was not just another rehearsal… The result was a 200 percent successful mission in quality and duration."[90]

In the historical document summarizing the Quill Program, Dr. Robert McDonald summarized the key points.

> "Quill, itself, is important to the NRO for at least five reasons. First, it demonstrated that radar imagery could be obtained from space, setting the foundation for future radar imagery satellite programs at the NRO. Second, Quill built upon the NRO's experiences with the Corona program setting a precedent for the NRO to leverage its resources and technology across multiple programs. Third, Quill contributed to an early culture of success at the NRO where technical savvy was a prized asset, favoring timely and well-informed decisions rather than dependence on cumbersome bureaucratic processes. Fourth, Quill was an important

[90] Quill, 17.

developmental assignment for Major David Bradburn who would become an Air Force Major General, serve as staff director of the NRO headquarters staff, and lead the Air Force's program at the NRO known as Program A. Finally, Quill was a trailblazing program for inviting cooperation from intelligence organizations outside the NRO to assist in assessing and improving NRO programs."[91]

Jack Kulpa

The truly remarkable aspect of Dave's early demonstration was that it was intended just to show proof-of-principle, not to end up with a complete, operational system. We worked hard with the Air Force Avionics Lab and ERIM, but it took several years after the demo before we could reduce the data sufficiently to get anything useful.

While the Quill experiment exceeded expectations and collected a significant quantity of analog radar data, the imagery was very difficult to interpret. As a result, developments to improve the intelligence usability of the data continued in SP-6 (expanded in organization chapter)."

Hexagon

Hexagon's beginnings were marked by contentious turf issues between the CIA and the NRO. Based upon operational experience with Corona and Gambit imagery, the Intelligence Community expressed a strong desire for imagery "with the area coverage of Corona and the resolution of Gambit." The CIA favored a revolutionary approach and in 1964 issued contracts to begin the preliminary efforts for such a system, code-named Fulcrum. At about the same time, the DNRO ordered SAFSP to begin a competing effort for a more evolutionary approach as a successor to Corona, code-named S-2.

Hank Stelling

The early 1964 DNRO directive established a new program competition between SP and DD&E. Jake (Col Jacobson) and I headed up the SP program, the Film ReadOut Gambit (FROG). With selection made in favor of the DD&E program, we were told that Dr. Edward Land, an advisor or

[91] Quill, ix.

member of the program selection committee, had successfully argued that Hexagon was lower risk, undercutting what we believed to be strongest reason to select the evolutionary FROG.

In 1965, after the chief antagonists had left the Government, the new DNRO, Dr. Alexander Flax, with help from the DCI and SecDef., decided to establish the same working relationship between Programs A and B on this effort that had worked so well on Corona. He "split the baby" and tasked the CIA (Program B) to develop the camera, related film supply and take-ups and conduct other sensor-related activities. SAFSP (Program A) would be responsible for managing the overall program; developing the bus, integrated structure, and recovery vehicles; and managing the integration and test, launch and on-orbit operations. This new combined program was code-named Helix.

> "Dr. Flax had designed the management mode for HEXAGON to comply with the provisions of the 11 August 1965 NRO charter and related agreements between the CIA and the Department of Defense. That essentially meant that the CIA would retain responsibility for sensor development and sensor-related activities (for Hexagon), and the NRO's Special Projects Directorate (in Los Angeles) for all else in the total program. The two agencies would, for each segment of their responsibilities, provide systems engineering, systems integration, and management."[92]

The CIA was now in full control of the Camera design. The revolutionary design engineering model, which had been initially developed and abandoned by ITEK, was transferred to Perkin Elmer (PE) (a small scientific optical instrument company who had built cameras for OXCART) for subsequent development and proof of concept testing. PE added some unique mechanisms, specifically the use of a revolutionary "twister- assembly" that made the revolutionary concept achievable. The revised PE design was selected as the new camera baseline.

The baseline Hexagon satellite design was far from stable. The camera went through several modifications due to internal design trades as well as changes in the overall satellite system concept. Not the least of these was the amount of film to be carried and the number of recovery vehicles

[92] Hexagon (KH-9), Mapping Camera Program and Evolution, Center for the Study of National Reconnaissance Classics, April 2012, i-7.

to be included. Additional concerns included the requirement for a pressurized film path to include the 120+ feet of film from the supply to the forward-most recovery vehicle. The final design included two 60-inch focal length F/3, cross-path scanning panoramic cameras. One tilted forward 10° and the other tilted aft 10°, yielding a 20° stereo convergence angle. The film load was 104,000 ft/side with a mixture of black-and-white and color film. A resolution of 137 lines/mm with a mean smear of less than 0.05 inches per second. The resultant Ground Resolved Distance (GRD) from 85 nmi would be about two feet, comparable to that achieved by Gambit.

Similarly, the bus and structure subsystems went through several iterations. The Lockheed-supplied bus was comprised mostly of up-sized Agena-based subsystems repackaged into a squat 10 ft diameter structure. The bipropellant system was replaced with a monopropellant system. The power system expanded to include two very large (largest at that time) deployable solar panels to handle the increased power loads. A backup (Lifeboat) system, similar to that employed on the Gambit Agena was included for limited recovery and deboost operations if the primary command and control systems failed. There was also a basic change in the design of the GE-supplied Extended (Primary) Command System, specifically in the triply-redundant majority-vote clock that was used on Gambit.

Because of their background in building large recoverable capsules for the Gemini program, McDonnell Douglas, in St Louis, was selected to supply the recovery vehicles. To give you some idea how large these were, the GE recovery vehicles used on Corona and Gambit were about the size of a large punch bowl. In fact, some of those recovered were re-purposed as such and presented as going-away presents to retiring higher-ups. By comparison, the McDonnell Douglas buckets were large enough to use as a group hot tub in your back yard. Some were re-flown but none were ever given away.

Subsequently, ITEK decided to develop and fly, on the nose of the Hexagon vehicle (vehicles 5-16), a wide-area mapping camera with its own recovery vehicle to provide basic Mapping, Charting and Geodesy (MC&G) products for the Defense Mapping Agency (DMA). SAFSP contracted with ITEK to build the terrain camera and the associated stellar cameras that provided position and pointing knowledge. GE

supplied the recovery vehicle which was almost identical to those flown on Corona and Gambit. The data from this system could be used on its own or in conjunction with the higher resolution pan camera imagery to make detailed maps needed for tactical and strategic forces.

In 1966, a joint DoD-CIA-NRO Executive Committee (ExCom) reviewed the effort and approved development go-ahead. The effort was henceforth named Hexagon.

In 1969, under severe budgetary constraints due to the Viet Nam War, the Nixon administration had to decide whether to continue Hexagon or the Manned Orbiting Laboratory (MOL) that had a "black" reconnaissance aspect code-named Dorian. The initial decision was to cancel Hexagon, but the DCI (Richard Helms) asked for a 48-hour delay to argue for a reversal. It was granted and Helms was able to assemble the data and show that Hexagon was the better go-forward alternative. Hexagon was reinstated and MOL terminated.

Dave Raspet

Frank "Buzz" Buzard, one of the three officers working for Lee Battle in the Air Force Corona Program, was the Program Director for Hexagon from program inception to first launch. As Program Director, Buzz was responsible for integrating the three SAFSP contracted elements – the space vehicle, the recovery vehicle, and the command computer – with the Program B-supplied search camera. Buzz held periodic Program Reviews that included the Program Managers for the SAFSP-supplied elements, Don Patterson, the Program B Program Manager, and Don's Perkin-Elmer support. At the time, SP-7 was bigger than Corona's three people, with about 25 officers. Unlike early Corona, there was an Aerospace contingent of about 25 people providing general systems integration. Buzz ran the program office in accordance with Battle's rules with strong empowerment for the staff members. The general organization was a wagon wheel with Buzz at the center. He reached out and tapped the responsible staff member directly when he needed information. When the program started, Bill Jones was Chief of Engineering, Lou Delisio was Chief of Integration and Test, and Jim Brown was Chief of Operations. Budgeting support came from SP-12 and contracting support from SP-9. Buzz tried a staff meeting near the beginning of the program but cancelled them after the first one as a waste of time. At one point Lou Delisio went into Buzz's office and tried to start a discussion of an organization chart. Buzz threw him out!

'I had responsibility for the GFE (Government-Furnished Equipment) command computer, LMSC avionics (Tracking, Telemetry and Command) and EMI testing of the integrated satellite including the camera. GE was struggling to build some semi-integrated circuits for us and Gambit (Gambit also GFE'd the command computer from GE). If we slipped our delivery schedules LMSC would have had a sizable claim for late GFE so we managed schedule very tightly and, for instance, used a whole C-141 to deliver our 110-pound computers (the computer had a ripping 49K of memory).'

What I remember best is that I never made a chart to brief Buzz. If he wanted to see it I'd have the contractor send us a schedule and, occasionally, General Allen would have GE come in and tell him how things were going. Buzz had little regard for chains of command so even though there were two officers in line above me, he'd seek me out for a report on how GE was doing. I might be called on to report in the hallway, in the bathroom or as part of a discussion of the season's horse racing at Hollywood Park, and I better know exactly what was happening at GE. Buzz worked his team in a "wagon wheel" structure – we all reported directly to him. The empowerment we got as Captains was amazing, but we didn't realize at the time what a rare gift we had.

Within SAFSP, some organizational issues remained to be resolved, including who would build and operate the targeting software. The issue was resolved early in 1967, when General Martin transferred that responsibility to SP-10 along with the SP-7 officer who developed a new unified approach, Captain Ned Gould. Ned developed the Hexagon software in SP-10 for targeting and commanding the satellite – in close coordination with SP-7. This was in concert with the SAFSP principle of "Mission First" as SP-10's responsibility was solely mission performance and served to isolate and emphasize mission operations performance responsibility to a separate organization while direct reporting to SP-1.

In June of 1971, the first Hexagon satellite, 55 feet long, 10 feet in diameter and weighing 27,500 lbs was launched from SLC-4E on a Titan 3D booster into a 100 x 160 nmi, 96° inclined sun-synchronous orbit with an argument of perigee at about 45° north. John McCone, the DCI at the time, remarked, "This will be the last generation of film-based systems we will ever field." The active camera mission lasted for 31 days with recoveries on days 5, 11, 25 and 31. To further wring out the system design, stress the hardware and refine operations training, a "solo" non-

ops period continued through day 52 at which point the entire vehicle was deorbited. The most notable issue during this mission proved to be tears in the recovery parachutes on the recovery vehicles. Recovery vehicle-1 was too damaged for an aerial recovery and had to be recovered from the ocean. Recovery vehicle-2 and -4's chutes had some damage but were air-recovered. Recovery vehicle-3, however, had so much damage that it came in ballistic, impacted the water at Mach-large and sank in the deep Pacific. There was a significant covert effort undertaken to locate and retrieve the bucket/film which was only partially successful. The deep-water submersible Trieste found the package at a depth of 16,000 feet and snagged the bucket, but the film started to decompress and snap off the roll as it was brought to the surface. The film was lost and any further efforts abandoned. This incident was briefly noted in the Guinness book of world records, as the deepest recovery of an object from the ocean depths. They referred to it as an electronic package without any reference to film or overhead reconnaissance.

Shortly after the Hexagon launch, President Nixon gave the go-ahead to develop a high-resolution electro-optical system to begin operations in 1976. It was decided that Program B would be responsible for this effort, but as this would tax the CIA development team, they would have to relinquish control over their efforts on Hexagon to Program A. In the summer of 1973, after a year of technical and contract overlap, as the last of the first block of Hexagon vehicles (SV-6) was being readied for launch, all Hexagon efforts (SV-7 and up) were officially transitioned to SP-7.

In addition to the main cameras developed by Program B, SP-7 was responsible for developing a stellar-terrain frame camera for Mapping, Charting and Geodesy (MC&G). This camera, although hosted on the same vehicle, was independent of the main pan-cameras and had its own recovery vehicle. It was flown on vehicles 5-16 before it was superseded by the addition of Solid State Stellar (S^3) cameras directly tied to the pan-camera structure, on vehicles 17-20.

During the following years the mission length increased and the GRD decreased as a result of improved system fine tuning and higher resolution films. The newer films had finer, more consistent emulsion grain size that offered improved resolution but which were slower and required more exposure time which increased the amount of smear that

could degrade resolution. By minimizing the exposure time to reduce the smear and using a "hotter" developing process to enhance contrast and bring out details, overall camera system performance improved, bettering the original 2-foot goal. Another improvement was the thinner Mylar-based films that allowed the film load to increase from 105,000 ft/side on Vehicle 1 to >150,000 ft/side on Vehicle 15 and up.

Tom O'Neill

One of the advantages of having the Primary Payload group in SP-7/21 was running the Post Flight Analysis (PFA) Team. This was a Customer, Contractor and NPIC team that assessed on-orbit photographic performance during the course of the Mission and made changes (via ground commands) to key parameters to optimize Focus, Synchronization and Exposure. Before the mission, we would convene the PFA and Ops teams and define a film budget and a set of on-orbit tests to be run during the four mission segments to be used in the post-recovery analysis. Top priority was given to the first segment (RV-1) as this was the earliest we could assess actual on-orbit photographic quality and make any necessary changes for the last three segments. This also required looking at all the film to make sure there weren't any camera anomalies that needed to be worked. This was a thrill for us as we could see areas of the world that we had only read about and were prohibited from visiting.

During the course of each segment, PE Ops would work the Engineering tests into the timeline making sure that the coverage had large amounts of populated areas to assess how the quality improved through focus and smear to see what the best settings were. These were done over CONUS as there were very large populated areas (East Coast, West Coast,…) and a better estimate of projected weather was available in the target area before releasing the vehicle to take the OP. Besides using the morning DMSP satellite data, PE got pretty good at calling the phone company information operators in the areas we were going to shoot, striking up a conversation and finally asking them what the weather was like back there. Good weather = Go. They didn't stop there. I can't count the number of times I'd be home sleeping in on a Saturday or Sunday morning after a long week or two on the road when the phone would ring. As the phone was on my wife's side of the bed she'd answer it, mumble a few unintelligible words into the phone and slam the receiver into my chest saying, "It's for you." I'd wipe away the cobwebs and mutter something into the phone. All my wife could hear was "Yeah, Peyton, give me a second." I'd put down the phone, get out of bed, go to the window and look out at the sky, then come back to bed, pick up the phone and say either, "Go for it," or, "Shut it down." I always wondered what my wife thought

about those calls. Someday I'll have to ask her.

As I said, engineering ops required a great deal of populated ground which we called "Culture." One time at a pre/post flight analysis (PFA), in the Hawkeye facility at EK in Rochester, it occurred at 2-3 in the morning. The PFA area was buried deep in the bowels of the building with 10 or so light-tables with variable magnification microscopes positioned throughout a 400-500 sqft room. Other rooms housed the more objective quality assessment equipment for performing smear-slit measurements and visual edge matching. In any case, it was several days into the PFA, we had been on since 7 p.m., the ambient lighting was turned down to reduce the glare on our eyes which were already strained looking through the scopes. One of the Photo Analysts, of Polish extraction, was complaining that after all the times he had participated in the PFAs he had never seen any photography of Poland. He feigned being upset and asked if during the next mission segment we could take an engineering Op over Poland. From some dark corner of the room came the rejoinder, "Don't you know there's no culture in Poland?" That literally brought down the house. People fell to the floor laughing. It was a good time-out, then we got back to work.

In 1972, SP issued the contracts for Vehicles 13-18 (Block 3). The majority of the changes addressed issues uncovered on the baseline design as well as modifications to extend the mission life and improve the reliability/redundancy of the system. One area where there was a major shortfall was in the amount of film that was not imaged. Bringing the film paths up to speed before beginning photo-ops, moved a lot of film that was not imaged. Similarly at the end of a photo-op it took a long time and a lot of film to slow down and stop. The initial concept was to use the time period between ops to rewind this film back onto the supply to include some of the already exposed film. That way at the beginning of the next op the exposed and unexposed film would be moved during the start-up time and the new exposures would occur right after the end of the previously exposed film had moved past the exposure slit. A good plan but on the early missions the film had a tendency to wander off to the side and induced a fold-over/crease and which continued to propagate the fold from that location. Rewinding the film could move the fold further back up the path toward the supply which would now be the new location for the fold propagation. So early-on in the program (~SV-2 or 3) the rewind ops were prohibited. This reduced the percent of the film load imaged from ~90% to ~75%. To regain this loss a major change to the film path was undertaken called Large Looper (LLO). Increasing the capacity of the Looper Assembly from 13 to 45 feet allowed the system

to store the un-imaged material in the Fine Film Section just prior to the focal plane. As such there was no need to rewind the Coarse Film Path (Supply and Take-up) after each photo-op. The imaging efficiency increased to ~93% after LLO was incorporated on Vehicle 17s and up.

The most unique and enduring hardware change was the incorporation of two Solid-state Stellar Sensors (S^3) in lieu of the ITEK mapping camera module, also starting on V-17. Each S^3 camera consisted of six linear CCD arrays mounted on a common sapphire substrate with known (precisely measured) spacing between arrays/elements and registration to the central optical axis. The two S^3 cameras were affixed to either side of the Two-Camera Assembly box frame and pointed up, out and back from the normal flight direction. Coolers minimized the dark current and improved sensitivity of the arrays, and electronics detected the star images as they swept across the focal plane during a photo-op. The data was time-tagged, recorded with the other vehicle telemetry on the tape recorders and sent down during normal Tracking Station contacts. The data was then post-processed and sent to DMA. Ground and on-orbit calibrations of the alignment between the Pan and S^3 Cameras allowed DMA to use the Pan film directly to make MC&G products as the S^3 data provided the needed position and pointing references. These cameras were built by PE along with major subcontractor support from Martin Marietta in Denver. Today, well after the demise of Hexagon and S^3, that basic technology lives on in the high-precision star trackers that BF Goodrich builds today in the former PE facility in Danbury, Connecticut. In fact, some of the same engineers were still there as late as five years ago, producing the new generation of star trackers.

On 18 April 1986 the last of the Hexagon vehicles (V-20) was launched on a Titan 34D from SLC-4E. After just clearing the tower the vehicle self-destructed, raining havoc on the pad and the surrounding launch complex. What an ignominious end to a magnificent program. During its operational life (1971-1986) there had been 19 successful launches, 86 successful vehicle recoveries containing over 3,400,000 feet of imaged film. Operational life had grown from 31 days to over 270 days. The system had photographed 800,000,000 nmi^2, with some resolution better than two feet. Hexagon had truly “met the challenge” defined for it 20 years earlier. And so ended the age of the film systems.

In the early 1980's, with the eventual end of Hexagon and the transition to the electro-optic system approaching, there was a push by DMA for an

interim system to cover the gap between the end of Hexagon and when they would be able to handle the new digital data. No one was quite sure what digital rectification was and how to do it. A Shuttle-based palletized variation of Hexagon was a natural and a MAPSAT-oriented concept was studied by SP-7. Ultimately, the community decided to invest in DMA digital processing instead. The MAPSAT effort was cancelled before production contracts were let.

"Rosie" Rosenberg

Hexagon was an exceptional contributor as it permitted us to dramatically improve our ability to rapidly cover (then revisit as needed) vast areas of the Communist World with resolution not thought possible with a panoramic system in space. It enabled us for the first time to provide continuously updated maps and charts for our priority Land, Naval and Air Forces at accuracies and quality that enabled Combat Forces to have awesome Situation Awareness...key to readiness and force effectiveness unknown to our adversaries.

As Director of the Defense Mapping Agency, I learned personally of the unbelievable capabilities Hexagon and Gambit brought to my mission. The metric accuracy of Hexagon dramatically improved our knowledge of the earth, which enabled us to provide the Combat forces with previously unheard of location accuracies that allowed the development of precision weapons like cruise missiles, Pershing, MRBMs, and today's Small Diameter Bombs that fit inside stealthy aircraft with only 50 pounds of explosives yet are as effective as a 2500-pound bomb.

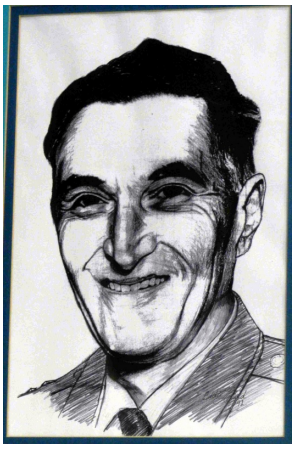
CHAPTER 5: SAFSP LEADERSHIP

This chapter summarizes the background of the general officers who served as Directors of SAFSP during the life of the organization.

Start Date	End Date	SP-1
Aug 1960	Jun 1965	MajGen Bob Greer
Jul 1965	Jul 1969	MajGen John L. Martin, Jr.
Aug 1969	Mar 1971	BrigGen Bill King
Apr 1971	Jan 1973	General Lew Allen
Jan 1973	July 1975	MajGen Dave Bradburn
Aug 1975	Jan 1983	MajGen Jack Kulpa
Jan 1983	Feb 1987	MajGen Jake Jacobson
Feb 1987	Dec 1992	MajGen Nate Lindsay
Jan 1993	Jul 1995	BrigGen Don Walker*
Jul 1995	Oct 1996	BrigGen Tom Scanlan*
Aug 1996	Nov 1998	BrigGen Rick Larned*

*East Coast

1960-1965: Major General Bob Greer
Drawing by Eddie Ward



Major General Greer graduated from the U.S. Military Academy in 1939. After receiving his pilot's wing he had various flying assignments including being a member of the first B-29 flight crew into the China-Burma-India Theater. After the end of World War II he served as an instructor of Electrical Engineering at West Point and on the special staff of Field Marshal Montgomery. In July 1959 he became Air Force Assistant Chief of Staff for Guided Missiles. In 1961, he became Vice Commander, Space Systems Division, Los Angeles, California. In that role he was also the Director of the Office of the Secretary of the Air Force SAMOS Project Office. In 1962 he was assigned as Director of SAFSP (SP-1) with responsibilities as Director of Program A within the new NRO.

Ken Caviness

In 1964, Col Paul Herron was director of SP-7 (Corona) and Col Bill King was director of SP-14 (Gambit). Gen Greer would refer to them as his two bald eagles.

1965-1969: Major General John Martin

Drawing by Eddie Ward

Major General Martin received his pilot's wings and was commissioned in 1941. From 1944 to 1945 he served in the 444th Bombardment Group in the China-Burma-India Theater of operations as an aircraft commander. He then received his Bachelor of Science degree from Brooklyn Polytechnic and Master of Science degree from MIT in Aeronautical Engineering. After several research and development assignments and as an instructor at AFIT, he was appointed Director of the NRO staff in the Pentagon (SAFSS). His next move was to the west coast where he became the Vice Director and then the Director of SAFSP (SP-1) with responsibilities as Director of NRO Program A.

> "Program A had come a long way in the late 1960s, thanks in large part to the innovative management of Brig Gen John L. Martin Jr. To impose more discipline on the acquisition process without adding the red tape that often stifled normal programs, Martin devised a specialized incentive structure for satellite contracts that greatly improved their performance and reliability. Based on his stellar performance, Martin was promoted to major general in March 1968 and moved in July 1969 to Headquarters AFSC."[93]

[93] Dr. John L. McLucas, Reflections of a Technocrat – Managing Defense, Air and Space programs during the Cold War. Air University, Aug 2006, p. 177.

1969-1971: Brigadier General Bill King
Drawing by Eddie Ward

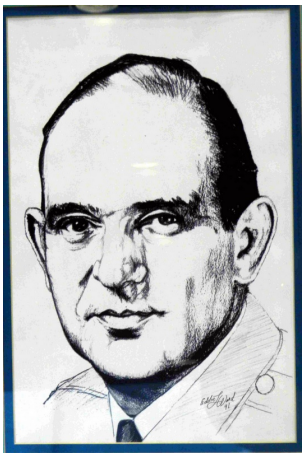
Brigadier General King is a pioneer in military space. He was a strong advocate for the value of space operations to the Air Force when few would listen. He attended Kansas State University and received an ROTC commission as a second lieutenant. During World War II he spent 39 months in the Pacific Theater of Operations. He received a regular commission in 1947 and was assigned to the newly formed Proving Center at Patrick AFB, Florida, where he participated in the surveys that built the eastern down range stations (he also commanded one). As a lieutenant colonel at Wright-Patterson AFB he was an advocate of the initial RAND report on the feasibility of space-based systems. He successfully convinced Air Force leadership of the value of WS-117L, "Discoverer," the unclassified name and cover for the highly classified Corona reconnaissance satellite. While at Wright-Patterson he was Program Director of the SM-62 Snark, the first U.S. strategic intercontinental missile. His first space assignment was to BMD in Los Angeles and then to the SAF SAMOS Project in 1961. He was the second Gambit program manager, after which he commanded the satellite command and control networks in Sunnyvale, and then became Director of SAFSP (SP-1) with responsibilities as Director of NRO Program A.

Ken Caviness

After Bill King retired and went to Aerojet-General, he and I played golf with Bill's new COO. The COO hadn't met Bill yet, and when they shook hands, the COO looked Bill up and down critically. "Who in the hell hired you? I gave specific orders never to hire a general!"

Bill calmly replied, "If it will make you feel better, I wasn't a good one." That was the beginning of a lasting relationship.

1971-1973: General Lew Allen
Drawing by Eddie Ward



General Allen graduated from West Point in 1946 with his pilot's wings. His first assignment was to the Strategic Air Command as a B-29 and B-36 pilot. After receiving a Master of Science degree in 1952, he earned a PhD in physics in 1954. He was assigned to the Atomic Energy Commission's Los Alamos Scientific Laboratory and then to Air Force Special Weapons Center. In 1961 he was assigned to the Office of the Secretary of Defense, Space Technology Office. After his initial assignment inside SAFSP as Deputy Director for Plans in 1965, he moved to the Pentagon as Deputy Staff Director and then Staff Director (SAFSS). He returned as Director of SAFSP (SP-1) with responsibilities as Director of NRO Program A. His career continued rapidly after SP with assignments as Deputy to the Director of the CIA and Director of NSA prior to being named commander of Air Force Systems Command and then Chief of Staff of the Air Force.

Historical Note

When he was assigned to Los Alamos Laboratory / Lawrence Livermore Laboratory, then-Lieutenant Lew Allen worked for Dr. Harold Brown who would become the eighth Secretary of the Air Force and then Secretary of Defense.

1973-1975: Major General Dave Bradburn
Drawing by Eddie Ward

Major General Bradburn graduated from West Point in 1946 as a rated pilot and was assigned to Briggs AFB, Texas flying the B-26. In 1948 he was transferred to Japan and in July 1949 joined the 3rd Bombardment Group. He flew 50 combat missions over North Korea as a flight commander on low-level daylight close support missions. After getting a Master of Science degree from Purdue University in 1952, he was assigned to Headquarters Air Research and Development Command (ARDC) working on aerial reconnaissance and radar systems. In May 1957 he moved to Los Angeles and was assigned to the WS-117L project, one of the first in the Air Force to be assigned to an Air Force satellite project. In December 1960 he moved to SAFSP and managed several small space projects including Quill, an early test of a radar satellite. He moved to Washington to become Director of the NRO staff (SAFSS) and then returned to Los Angeles as Director of SAFSP (SP-1) with responsibilities as Director of Program A. In August 1975 he became Vice Commander of Electronic Division in Air Force Systems Command.

Don Thursby

Back in the early 1970's the new mission was to get data directly to the commander on the FEBA (Forward Edge of the Battle Area). I had a payload with possibilities if it could be "trailerized." We decided to go for it but needed a catchy name, so we used DRACULA…Direct Readout and Collection ULA ("ULA" was the three-letter shorthand for the URSULA payload). I put a briefing together to take east, but needed to get it through SP-1. Gen. Bradburn liked the briefing but trashed the name, saying that he could already hear the welcome by the East Coast: "Oh, no, not another blood sucking program from out west!"

1975-1983: Major General Jack Kulpa
Drawing by Eddie Ward

Major General Kulpa graduated from West Point in 1950. After flight school, his early assignments included flying reconnaissance missions with the Strategic Air Command out of Japan and England. From there he went to AFIT for a master's degree in aero engineering. His first assignment out of school was to work for General King in the Snark SPO at Wright-Patterson AFB. In 1963 he was assigned to SAFSP. One of his first jobs was as the manager of a small satellite project (P11 / P-989). After two years he was made System Program Director for the P-417 (DMSP) weather satellite. His orders were to take the "black" P-417 program and make it grey as DMSP and provide direct support to combat forces in Viet Nam. From there he spent time at Wright-Patterson AFB as Commander of the Avionics Laboratory and as Aeronautical System Division Deputy for Engineering. Next he went back to the NRO as Director of the NRO Space Staff (SAFSS). He was then commandeered as Principal Deputy to the Director of Central Intelligence for Plans for the Intelligence Community. His final assignment in July 1975 was to Los Angeles as Director of SAFSP (SP-1) with responsibilities as Director of Program A. After retirement from the Air Force he served as Chairman of the Board of the Environmental Institute of Michigan and as a Los Angeles County Supervisor.

Don Thursby

SP's P-11/P-989 "subsats" rode into orbit from VAFB on Thor Agena-D's. At 150 pounds, the subsats were spring-erected and ejected, spun up and lofted into higher orbits by small solid rocket motors. They were "Heathkit-Sats" delivered to the base in a box of parts, assembled, tested and readied for launch under the Launch Services Contract. With assembly and test at VAFB, a free ride up, and flown from the Blue Cube, it was a very successful, cost-effective program. Later, at 450 pounds, the subsats rode sidesaddle on Hexagon into orbit.

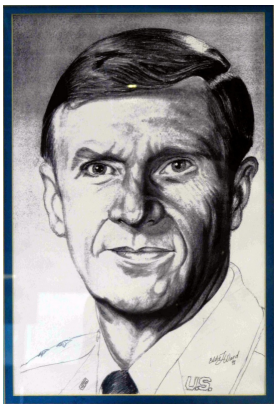
1983-1987: Major General "Jake" Jacobson
Drawing by Eddie Ward

Major General Jacobson graduated from the U.S. Naval Academy in 1956 and became a second lieutenant in the Air Force. He received his pilot's wings in 1957 and served as a C-119 and C-123 pilot and aircraft commander until he entered the Air Force Institute of Technology. Following graduation he was assigned to the Ballistics Systems Division, Norton AFB, California, as project officer for the inertial guidance system used on the Titan II. "Jake" was then assigned to the Directorate of Plans, Headquarters U.S. Air Force. From there he volunteered for service in Southeast Asia and was assigned to Nha Trang Air Base, Republic of Vietnam, where he flew 299 sorties in UC-123K's. General Jacobson was then assigned to SAFSP where he served as a research and development project officer, division chief and deputy director for research. Following graduation from the Naval War College, he returned to the west coast as commander of the Air Force Satellite Control Facility. In March 1979 he was assigned to the Office of the Deputy Chief of Staff for Research, Development and Acquisition at Air Force Headquarters and in June 1980 he was named director of space systems and command, control and communications. In 1983 he became Deputy Director and then Director of SAFSP (SP-1) with responsibilities as Director of NRO Program A. From 1987 to 1997 he served as President of Draper Laboratory.

Pete Swan

Col. Jake hired me into SP-6 in 1974, and then Major General Jake hired both Cathy and me out of grad school in 1984. We worked especially hard to fulfill his expectations. The only thing I am really sure of is that after years inside the organization led by Gen Jake, we – as an organization – continually improved the Nation's ability to "spy on the Russians."

1987-1992: Major General Nate Lindsay
Drawing by Eddie Ward



Major General Lindsay earned Bachelor of Science and Master of Science degrees in mechanical engineering from the University of Wisconsin, and a Master of Science degree in systems management from USC. He served at the U.S. Air Forces Europe Weapons Center, Wheelus Air Base, Libya, and Lindsey Air Station, West Germany, as a staff officer for conventional munitions. He entered the Air Force Institute of Technology in June 1963 as a graduate student in heat transfer and thermodynamics. He was then assigned to the Propulsion Directorate, Titan III System Program Office, Space Systems Division, Los Angeles Air Force Station. After assignments at Air Force Armament Laboratory and Headquarters Air Force Systems Command he was assigned to SAFSP. From July 1973 to August 1978 he served in SAFSP's Launch Vehicle Integration Division (SP-16).

Seb Coglitore

I was hired into SAFSP-7A by Colonel Don Alser. When I reported in a few months later, I found out Colonel Alser was now running SP-11 and Colonel Nate Lindsay was the director of the new SPO, SP-16. A pretty dynamic organization!

As the launch integration manager for one of the NRO programs, I'd spend more time with the boss as we neared our next launch date. My most vivid memories of those days involved driving to LAAFB, picking up a staff car, proceeding up PCH to pick up Colonel Lindsay, and off we'd go to Vandenberg for the readiness reviews and the launch. During these one-on-one discussions driving up and down the coast, I absorbed a great deal of Colonel Lindsay's technical knowledge, management and leadership style as well as an appreciation for the organization where we worked. We were SAFSP…a pretty special organization.

Don Hard

When I worked for Nate in SP-16, I was most impressed with his approach of always dealing with someone who could make things happen. For example, when we started working STS Transition with NASA, we dealt directly with Chris Kraft, JSC Director, and Bob Grey, KSC Director, until they appointed Glynn Lunney as the NASA POC (SPDPO). When we worked Titan issues, we dealt directly with the Martin Company VP in charge (Carnahan), and we did that occasionally on the spur of the moment. On one occasion, Nate and I had traveled to the Cape, where we were working a Titan issue. We weren't satisfied with what we heard there, so we flew directly to Denver that evening to talk with Carnahan. Unfortunately, we got there in the middle of a blizzard wearing short-sleeve blues.

General Lindsay moved to the NRO staff (SAFSS) where he was responsible for space systems policy, plans and security. In November 1980 he returned to Los Angeles to become director of operations support for Space Systems Division. He became the Deputy Commander for Launch and Control Systems for Space Systems Division, with command oversight of the Air Force Satellite Control Network. He then became Director of SAFSP (SP-1) with responsibilities as Director of NRO Program A.

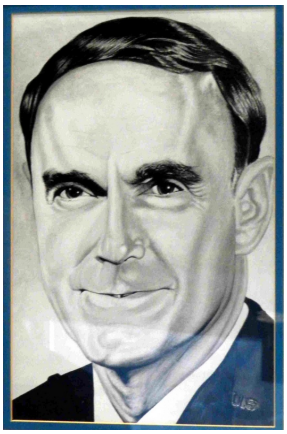
Gainey Best

General Lindsay had a way of making you the center of the conversation even if you were discussing something that centered on him. He was always respectful and supportive regardless of your rank. He listened intently to you and made sure you knew that he appreciated what you said.

Don Hard

I quickly noticed in SP-16 that Nate [Lindsay] was always in a hurry. I had to run to keep up with him when we were going anywhere together. His explanation was something like, "It helps to get people to think you are really busy. They tend to be more responsive then, and they may even pick up the pace themselves." I've noticed over the years that this approach really does work.

1993-1995: Brigadier General Don Walker
Drawing by Eddie Ward



Brigadier General Walker started his career in launch as a propulsion engineer in the Titan III Program Office followed by several assignments in satellite operations. He served on the NRO Staff as a Program Element Monitor (PEM) and headed Advanced Plans. Following Air War College, he became the Director of SP-10, then Commander of the Air Force Satellite Control Facility, then SPO Director for MilSatCom, followed by Director of SAF/SS, and then Director of SAFSP (SP-1).

After a major NRO reorganization, he became the first Director of the NRO Plans and Analysis (P&A) office, and later was both the NRO Director of SIGINT and NRO Launch Director. As part of the directed NRO reorganization, he transitioned Program A into an Air Force element within the NRO while he remained Director of SAFSP and continued to manage Air Force personnel within the new NRO organization.

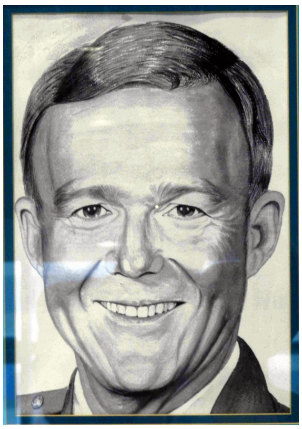
John Pace

I was the Director of SP-9 during the early Walker days, and he was full of ideas. Every meeting I attended with him, in any forum (meetings with industry, internal status or staff meeting…wherever), resulted in a dozen or so action items for me. I was concerned that I was letting him down because I couldn't keep up with him. I told him about my concern. He told me in essence, "John, it is your job to sort through those ideas and identify the ones you deem worthy of pursuit." I did and was relieved and grateful for the trust Gen Walker put in me.

Rich Wendt

In 1983 I worked with LtCol Don Walker, Maj Frank Stirling, Mr. Whit Hill, LtCol Dee Smith and USN CAPT Marc Langholz for a small group as part of the NRO Staff (SAFSS). Don Walker had the nickname "Vaporman" because you could be talking to him, turn away for a moment, and he would disappear! He did this often in the Pentagon.

1995-1996: Brigadier General Tom Scanlan
Drawing by Eddie Ward



Brigadier General Scanlan served most of his career in the Air Force space arena, including space operations, program development and the NRO. He served in various Air Force and joint positions including 1st Space Wing Commander (Air Force Space Command), Program Manager of two major programs at the Space and Missile Systems Center, and Director of Operations (U.S. Space Command). In the Office of the Secretary of the Air Force, he served as the Director SAF/SS and as SP-1. After the transition of Program A, he served in the NRO as the Director of Communications, the Director of Space Launch and the Director of SIGINT Programs.

1996-1998: Brigadier General Rick Larned
Drawing by Eddie Ward

Before joining SP, Brigadier General Larned had several Air Force tours unrelated to space. As a development engineer, he helped the Army improve the survivability of Huey helicopter engines, monitored contractor development of advanced technologies used in Minuteman reentry vehicles, served as aide to the commander of Air Force Contract Management Division, and tested the nuclear survivability of Air Force aircraft, satellites and electronics. After a tour as the Executive Officer to the Secretary of the Air Force, his NRO tours were interspersed with working space doctrine for Air Force Space Command, and serving as deputy director of operations for AFSPC, deputy wing commander at Schriever AFB, wing commander of the 341st Missile Wing, and director of space programs for the Assistant Secretary of the Air Force (Acquisition). His NRO assignments included SAFSP (SP-12 and SP-2) and SAFSS (Defense Reconnaissance Support Program and NRO Director of Budget). Concurrently with his NRO duties as Director, SIGINT Programs and then Director, IMINT Programs, Larned served as Director, Office of Special Projects (SP-1).

Gail Allen

I remember Rick from many activities, but especially in his team building through sports. As captain of our Intramural volleyball team, Rick had a knack for bringing people together (as well as for hikes, runs, tennis, frisbee golf, and even badminton) towards common goals. Of course, there was also the aspect of competitiveness that jumped out every once in a while, leading to such things as Base Volleyball Champions. Regardless of the activity, he always promoted teamwork, inspired esprit de corps, brought out the best in us, and made our everyday work environment FUN!

After SAFSP

The Air Force is still heavily involved in the NRO mission, providing 45% of the personnel in Westfields and significant support at both launch facilities and many of the operations centers. The senior Air Force officer, usually a Major General and the Deputy Director of the NRO, is responsible for the "care and feeding" of the Air Force people assigned to the national agency, but s/he is no longer the Director of SAFSP. Mission performance throughout the NRO remains extremely high, along with pride in accomplishing an important mission for the United States.

Rick Larned

By the 1970s it was easy to tell a person's heritage. If they grew up in the field, they would talk about SP, OD&E or PME-106. If they grew up on the Staff, they would use A, B and C. The dichotomy was driven first by security, and then by habit. Kipling's "Never the twain shall meet" was absolute, and it is still true today.

CHAPTER 6: SAFSP'S LEGACY

The SAFSP of old is no more. Its legacy lives on, though, as SP activities were absorbed by the parent NRO. The people, programs and knowledge transitioned to other critical national missions, demanding requirements, and incredible technologies. The missions are every bit as challenging, and the people of the NRO team – government, The Aerospace Corporation, industry and academia – are successful because they have the know-how and resources to get the job done. Many individuals committed their careers and lives to SAFSP over the last 55 years, and that service and sacrifice continue today in the NRO. The lessons we learned "oh so far back" are still being leveraged, and the nation continues to benefit immeasurably.

"Rosie" Rosenberg

Those who were part of SAFSP can take pride in knowing they helped us see, hear and know with certainty what was going on in the Soviet Union, Warsaw Pact and other Communist States – and to develop land, naval and air combat forces to deter and contain them. We understood their technical capabilities in great detail – which led to the design of our weapons – and we understood their intentions.

If those who follow are looking for a takeaway from this monograph, then it is this.

Technologists – scientists, engineers, physicists, dreamers – have always responded when America calls. The Manhattan Project, nuclear submarines, Kelly Johnson's Skunk Works, stealth aircraft, counter-IEDs, UAVs, Special Ops, cyber are the headlines, but the hard work is done several levels down by ordinary people called upon to do extraordinary things to meet daunting challenges. There is absolutely no question that new threats are just around the corner. It is hard to imagine but they will be even scarier – more lethal, more complex, more diverse, more threatening to more Americans than ever before. One thing you can take to the bank: since Paul Revere and his Minutemen, our Nation has responded to every crisis with commitment, ingenuity and sacrifice. Every generation steps up. Every adversary should beware.

SAFSP was one part of this country's response to the Russian Bear. Dedicated people, committed leadership, and a determination to

find answers in a sea of unknowns made reconnaissance satellites not only possible, but work horses national decision-makers still rely upon every day. Overhead photography continues to evolve more than anyone could have anticipated 55 years ago. Today we treat Google Earth as a household utility. How far we've come.

While the Cold War defined initial requirements for satellite reconnaissance, the hot wars of Vietnam, Desert Storm, Iraq and Afghanistan pushed for getting more intelligence, surveillance and reconnaissance to the warfighter. As the threats have changed – from Soviet tanks in the Fulda Gap to ISIS, Boko Haram and everything in between – the demand for overhead reconnaissance has increased exponentially. The NRO has accepted all challenges and continues to excel at providing intelligence to its customers.

On December 6, 1997, the DNRO (Keith Hall) publicly acknowledged SAFSP's tie to the NRO. His words are as important today as they were back then, and represent a public thank-you to those who served in and with SAFSP:

> "This, of course, is much more than just a holiday party; it is an opportunity to make a long-awaited announcement. Tonight, for the first time, we will speak openly about some of the achievements of the Air Force Special Projects Organization. It is a particular pleasure to welcome the spouses, family, and friends of the people who were assigned to or who worked closely with the SP organization. You have supported the careers of people who worked long, hard, and with great dedication. At the same time, you probably know little about the details of their work. Well, to put it mildly, we owe you an explanation. We probably owe you lots of explanations, but I'm only going to offer one tonight. First, let me repeat who I am. I am the Assistant Secretary of the Air Force for Space and the Director of the National Reconnaissance Office or "NRO." If a Director of the NRO had introduced himself that way in an open forum a few years ago, there would have been an audible gasp. There was some joke that the letters NRO stood for "Not Referred to Openly." In 1992, we made public the fact that there was an NRO and that it designs, builds, and operates reconnaissance satellites for the United States. Slowly, we are declassifying some other aspects of our work and our organization.

> Today we formally declassified the fact that SP was an integral part of the NRO. Tonight I am announcing that fact for the first time in an unclassified setting. You may now gasp!"
>
> "For…many…reasons, we could not even acknowledge the existence of the NRO. The people who worked for the NRO, including the men and women of SP, could not discuss the specifics of their jobs or reveal any information that would confirm that we were using satellites for reconnaissance. More often than not, what SP people were doing, and locations they were visiting, were highly classified. Our efforts in security reform enable me, tonight, to pay tribute to Special Projects and their government and contractor associates who quietly made such a great contribution to our national security. For a period of almost 37 years, they have operated without public or even family knowledge of their achievements. The SP family worked together with a degree of trust and harmony seldom seen in any group. The mission always came first, before organizational, personal, and company gain."
>
> "There are many stories of achievement and personal sacrifice behind SP. They often had to overcome almost insurmountable technological and logistical odds. We still cannot tell all of the stories or publicly give all of the credit that these people deserve. Although we no longer conduct satellite reconnaissance in a completely closed environment, our technology, our methodology and a good deal of our operations and locations must remain classified."

It is perhaps fitting to close with the citation DNRO Hall presented to SAFSP in 1997 as the organization was being closed down and the people and projects moved to the east coast:

> "The Office of Special Projects, Office of the Secretary of the Air Force distinguished itself by especially meritorious service for the 36-year period from 1961 to 1997. As the Air Force component of the National Reconnaissance Office (NRO), Special Projects' men and women pioneered and revolutionized space technology, streamlined acquisition and operated reconnaissance satellites that played a critical role in the security of our nation. During the Cold War, these systems provided worldwide intelligence, monitored

> arms control treaties, and preserved peace by continually observing and reporting on threats capable of delivering nuclear warheads to the mainland of the United States. In armed conflict, these systems provided information essential to saving the lives of our military forces and those of our allies. As these operations were highly classified, the men and women assigned to this organization conducted these activities without acknowledgement of their critically important mission. The exceptionally superior achievements of the Office of Special Projects reflect great credit upon its individual members and the Intelligence Community."

At its core, SP's organizational culture reflected the values and assumptions of Air Force and CIA leaders who believed in the promise of satellite reconnaissance. Since the days of Bennie Schriever, Bill King and Bob Greer, Air Force pioneers were convinced that strategic reconnaissance from space could prevent wars and prepare the nation for crises. SP was the organizational manifestation of that conviction. New cameras on satellites further increased the knowledge for our nation's leaders. Early management of the organization established unique approaches to significant challenges when the Nation faced an urgent need to gather intelligence over denied territories. The SP culture developed around small, covert teams of top-quality, hand-selected people; direct, hands-on management by superb government, Aerospace Corporation and industry ground-breakers; and technological leaps that stagger the imagination even today. This radical approach has proven successful every time the nation has faced a quantum change in the threat – and it will be just as successful the next time America dials 9-1-1.[94]

For the future, rocket science will remain a heady mixture of skill, inspiration, luck and Providence, exemplified in a recollection from Steve Soukup. When an SP Titan IV launch seemed irrevocably cursed following three unsuccessful launch attempts in early 1994, the SP Program Office contacted the Patrick AFB Chaplain to see if he could invoke some "Divine Guidance" to help get the Titan off the launch pad. The Chaplain, Captain Roger Ericson, crafted the following "Launch Prayer":

[94] Adapted from Dr. Melvin G. Deaile's concluding paragraph in his article, "The SAC Mentality: The Origins of SAC's Organizational Culture, 1948-1951," published in Air & Space Power Journal, Mar-Apr 2015. While the SAC and SAFSP cultures are orthogonal, their motivating forces – superb leadership responding to a national urgency – are strikingly similar.

"O Lord, giver of strength and our daily needs, over these past two weeks we have gotten so excited and have been so disappointed. ‘Three was not the charm.’ Again we wonder, will it go today?

"Our Titan team is more than ready. Bless each and every partner. Bring together these complicated systems which reflect sophisticated co-dependency, using temperamental batteries, valves, motors, umbilical cords and toxic fuels – and grant us launch-able weather.

"Recharge our own batteries every day, so we can meet the daily demands, or should we call them our daily opportunities. Remind us that we are gaining experience from each launch attempt, and we can succeed even when we don't launch. May there not be any loss of life or environmental accident; yet, please may there not be an abort of this Titan mission today.

"Above all may your kingdom come and your will be done by me, and by the rest of our Titan team at the Cape, and on the Base. These workday concerns are important to us, and so, hear our prayer, for the glory of your Holy Name. Amen!"

On the fourth try, the launch was divinely perfect.

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APPENDIX A – GLOSSARY OF ACRONYMS

Acronym	Explanation
417	weather satellite designation
AF	Air Force
AFBMD	AF Ballistic Missile Division
AFCMD	AF Contract Management Division
AFIT	Air Force Institute of Technology
AFMPC	AF Military Personnel Center
AFPRO	AF Plant Representative
AFSC	AF Systems Command
AFSCF	Satellite Control Facility
AFSTC	AF Satellite Test Center
APRA	Advanced Research Projects Agency
ARDC	Air Research and Development Command
ASPO	Army Space Program Office
BCS	Byeman Control System
BMD	AF Ballistic Missile Division
BMD	Ballistic Missile Division
BYE	Byeman Security System
Byeman	Byeman Control System
CI	counter intelligence
CIA	Central Intelligence Agency
DARPA	Defense Advance Research Program Agency
DCAA	Defense Contract Audit Agency
DCAS	Defense Contract Administration Services
DCASO	DCAS office
DCI	Director of Central Intelligence
DDR&E	Deputy Director for Research and Engineering
DDS&T	Deputy Director for Science and Technology

Acronym	Explanation
DMSP	Defense Metorological Satellite Program
DNRO	Director of the NRO
DoD	US Department of Defense
DTV	development test vehicle
ELINT	electronic intelligence
EMI	Electromagnetic Interference
ExCOM	DoD / CIA / NRO Executive Committee
FAR	Federal Acquisition Regulation
GFE	Government Furnished Equipment
I&W	Indications and Warning
ICBM	Intercontinental Ballistic Missile
IMINT	photographic (Imagery) intelligence
ITEP	Intelligence and Tactical Exploitation Processor
JPL	Jet Propulsion Laboratory (part of NASA)
LAAFB	Los Angeles AF Base (or station)
LAAFS	Los Angeles AF Station
LAX	Los Angeles International Airport designation LAX
MC&G	Mapping, Charting and Geodesy
MPC	AF Military Personnel Center
MSE	Manned Spaceflight Engineers
MSS	Missile and Space Systems
NASA	National Aeronautics and Space Administration
NPIC	National Photographic Interpretation Center
NRO	National Reconnaissance Office
NRP	National Reconnaissance Program
NSA	National Security Agency
NSC	National Security Council
OD-#	Operations Division #x
OD&E	Office of Development and Engineering (of CIA)
OSD	Office of the Secretary of Defense

Acronym	Explanation
P&A	Plans and Analysis
PALC	Point Arguello Launch Complexes
PET	Performance Evaluation Team
PME-106	Navy Space Project
Program A	AF element inside NRO
Program B	CIA element inside NRO
Program C	Navy element inside NRO
Program D	Overhead aircraft inside NRO
R&D	Research and development
RDT&E	research development testing and evaluation
RTiP	Real Time interim Processor
SAC	Strategic Air Command
SAFSP	Secretary of the Air Force, Office of Special Projects
SAFSP	Secretary of the Air Force, Office of SAMOS Project
SAMOS	Space and Missile Observation System
SAMSO	Space and Mission Systems Organization
SAR	Search and Rescue
SCF	Satellite Control Facility
SecAF	Secretary of the Air Force
SIGINT	Signals Intelligence
SLC-#	Space Launch Complex # 1, 2, or…
SMC	Space and Missile Center
SP	Secretary of the Air Force, Office of Special Projects
SP-#	SAFSP office designation, 1 through X
SPO	systems program office
SPP	Special Purpose Processors
SSD	Space Systems Division
STS	space transportation system (the Shuttle)
TENCAP	Tactical Exploitation of National Capabilities
TIROS	weather satellite - Television Infrared Observation Satellite System
TT&C	Tracking, Telemetry and Command (sometimes commanding, control, or communicaitons)

Acronym	Explanation
USAF	US Air Force
USAF	Air Force
USN	US Navy
USSR	United Soviet Socialist Republic
V-2	earlist rocket
VAFB	Vandenberg Air Force Base
WDD	Western Development Division
WPAFB	Wright-Patterson AFB
WS-117L	Weapons Systems # 117L (Space Systems inside the AF)

APPENDIX B - Orders Referenced in the Text

The following orders were used to ensure correctness of facts, dates and activities. Each will be shown on a full page to ensure completeness of understanding.

Date	Topic	Important Item	Comment
Aug 31, 60 # 116.1	Director of SAFSP	Creates west coast office of NRP – Assigns BGen Greer – Allocates people	Title is for SAMOS Project
Nov 20, 61 # 116.1	Director of Special Projects	Went along with the creation of an NRO	Also made him Deputy at BMD
July 19, 62 # 116.1	Director of Special Projects	Occurred in parallel with the refinement of the NRO with Program A designation	Directly responsible to the Secretary of the AF, as the previous ones showed.
Dec 15, 60 # 116.2	Creation of the AF Satellite Photographic Processing Lab	Reporting to SAF SAMOS Project	Confirms that SAMOS was in the title at this time.

NO: 116.1
DATE: August 31, 1960

SECRETARY OF THE AIR FORCE
ORDER

SUBJECT: The Director of the SAMOS Project

1. Effective this date, Brigadier General Robert E. Greer, Assistant Chief of Staff for Guided Missiles, is designated as Director of the SAMOS Project, with additional duty as Vice Commander for Satellite Systems, AFBMD, ARDC, with duty station at 2400 East El Segundo Boulevard, El Segundo, California.

2. The Director will organize an office to manage the SAMOS Project. Manpower to staff the office will be drawn from manpower available to him as Vice Commander for Satellite Systems. The SAMOS Project Office will be a field extension of the Office of the Secretary of the Air Force.

3. The Director is responsible to and will report directly to the Secretary of the Air Force.

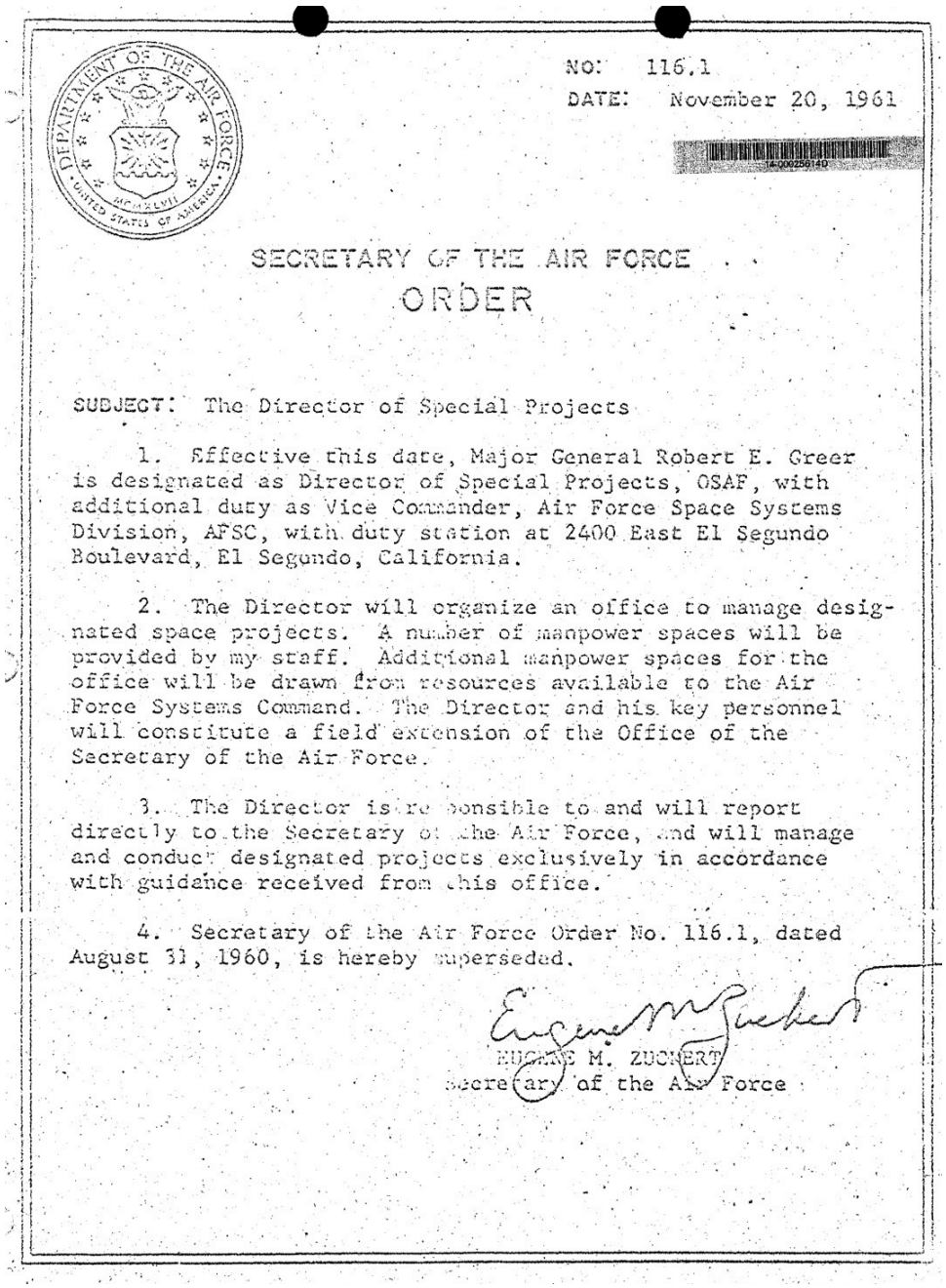
4. Additional duties may be assigned to the Director as deemed appropriate by the Secretary of the Air Force.

Dudley C. Sharp

DUDLEY C. SHARP
Secretary of the Air Force

AFHQ FORM 0-862, 17 JUN 55

Presidential Direction Responding Orders SAFSP [SAMOS Projects] – SAF 116.1, 31 Aug 1960.



NO: 116.1
DATE: November 20, 1961

14-00000

SECRETARY OF THE AIR FORCE
ORDER

SUBJECT: The Director of Special Projects

1. Effective this date, Major General Robert E. Greer is designated as Director of Special Projects, OSAF, with additional duty as Vice Commander, Air Force Space Systems Division, AFSC, with duty station at 2400 East El Segundo Boulevard, El Segundo, California.

2. The Director will organize an office to manage designated space projects. A number of manpower spaces will be provided by my staff. Additional manpower spaces for the office will be drawn from resources available to the Air Force Systems Command. The Director and his key personnel will constitute a field extension of the Office of the Secretary of the Air Force.

3. The Director is responsible to and will report directly to the Secretary of the Air Force, and will manage and conduct designated projects exclusively in accordance with guidance received from this office.

4. Secretary of the Air Force Order No. 116.1, dated August 31, 1960, is hereby superseded.

EUGENE M. ZUCKERT
Secretary of the Air Force

Nov 61 – 2nd set of orders # 116.1

NO: 116.1
DATE: JUL 19 1962

SECRETARY OF THE AIR FORCE
ORDER

SUBJECT: The Director of Special Projects

1. Effective 1 August 1962, Major General Robert E. Greer is designated as Director of Special Projects, OSAF, with additional duty as Deputy Commander for Satellite Programs, Space Systems Division, AFSC, with duty station at 2400 East El Segundo Boulevard, El Segundo, California.

2. The Director will organize an office to manage designated space projects. A number of manpower spaces will be provided by my staff. Additional manpower spaces for the office will be drawn from resources available to the Air Force Systems Command. The Director and his key personnel will constitute a field extension of the Office of the Secretary of the Air Force.

3. The Director is responsible to and will report directly to the Secretary of the Air Force, and will manage and conduct designated projects exclusively in accordance with guidance received from this office.

4. Secretary of the Air Force Order No. 116.1, dated November 20, 1961, is hereby superseded.

Eugene M. Zuckert

EUGENE M. ZUCKERT
Secretary of the Air Force

AFHQ FORM 0-862. 17 JUN 53

July 62 – 3rd set of orders # 116.1

CONFIDENTIAL

NO: 116.2
DATE: December 15, 1960

SECRETARY OF THE AIR FORCE
ORDER

SUBJECT: Organization and Functions of the Air Force Satellite Photographic Processing Laboratory

1. There is hereby established the Air Force Satellite Photographic Processing Laboratory (AFSPPL) at Westover Air Force Base, Massachusetts.

2. The Laboratory will be under the command of the Director of the SAMOS Project, 2400 East El Segundo Boulevard, El Segundo, California. It will be attached to the Air Force Command and Control Development Division, Air Research and Development Command, L. G. Hanscom Field, Massachusetts, for administrative, logistic, and contractual support.

3. The mission of the AFSPPL will be to conduct the research and development necessary to provide the best possible equipment, techniques, and knowledge applicable to satellite photography, to insure that the processing and duplication of photography obtained from satellite vehicles is of the highest possible quality, and to process, duplicate, and distribute this photography to designated users.

4. Physical space and some resources and manning for the AFSPPL will be taken from the 8th Reconnaissance Technical Squadron. The 8th Reconnaissance Technical Squadron will

APHQ FORM 0-868, 17 JUN 62

CONFIDENTIAL

Dec 15, 60, # 116.2, Creation of the Satellite Photographic Processing Laboratory

APPENDIX C – SAFSP ALUMNI ASSOCIATION

Charter

- **Whereas:** For more than four decades the **Directorate of Special Projects, Office of Secretary of the Air Force** (SAFSP), served the nation with great distinction, performing missions of the highest national importance. The personnel of SAFSP worked with total dedication and devotion to the organization and its mission. The families of its personnel shared equally the devotion, having to endure their spouse's and parent's long work days, weekend work and trips away from home. To help mitigate this stressful environment the personnel of SAFSP and their families became very close. In essence they became an ***SP Family***. All were very **S**pecial **P**eople and all were considered as members of SP. To ease the stress, share common experiences and foster fellowship SAFSP developed a tradition of social functions, such as Wreck Day, Spring Swing Golf and holiday season dinners. SP people were proud of the organization and its mission. They believed their organization and its people were truly fortunate.
- **Whereas:** Having successfully accomplished its original national purpose, the mission and organization of SAFSP has changed. Successor activities have moved away from Southern California.
- **Whereas:** There no longer exists a government organization to carry on the social traditions. There is a danger that the heritage of fellowship, the understanding of the unique nature of the organization, and knowledge of the profound service performed by SAFSP people to the nation and to the world will fade away.
- **Therefore:** The former Directors of the directorate of Special Projects, Office of Secretary of the Air Force who currently live in Southern California have agreed to establish and sponsor a fraternal non-profit organization in California. The name of the organization will be the **SAFSP Alumni Association**.
- **Location:** The Association will maintain its primary place of business and bank accounts in the greater Los Angeles area.
- **Purpose:** It will provide a means of continuing contact between past members of SAFSP and help to maintain the organization's camaraderie and heritage. It will sponsor social functions and other activities that preserve the traditions and history of SAFSP and it's people. It will establish and maintain a directory of names and addresses of past SAFSP personnel or their surviving spouses.
- **Membership:** All past military and civil service personnel assigned at any time to SAFSP and/or their spouses are eligible for Regular Membership. Military and civil service personnel not directly assigned to SAFSP, but whose primary duty was to support the SAFSP mission are eligible for Associate Membership. The Aerospace Corporation personnel who directly supported SAFSP are eligible for Associate Membership. Contractor personnel who directly worked on SAFSP projects may be offered a Special Membership upon the approval of the Board of Directors.
- **Classes of Membership:**
    - **Regular Member:** Regular member will receive invitations to all social events; may serve as alumni officers and on activity committees; their names and addresses will be maintained in the SP directory for five years from last contact; will receive a yearly accounting of fiscal status of the association; will be allowed to vote on any voting issues brought before the membership.

- **Associate Member:** Associate members will receive invitations to all social events; their names and addresses will be maintained in the SP directory for three years from last contact.
- **Special Member:** Special members will receive invitations to all social events; their names and addresses will be maintained in the SP directory for two years from last contact.

- **Organization:** The Board of Directors will consist of all former Director of SAFSP living within commuting distance of Los Angeles who agrees to serve on the Board. The Board will appoint a treasurer, other officers and committees as required. The Board will meet at least twice annually: in the fall to approve the social event budget and calendar for coming year; and in the early spring to review the annual financial status of the association and to make personnel appointments as needed.
- **Financial:** The Treasurer will be appointed by the Board of Directors and report to the Board. He will be responsible for maintaining a bank account, receiving all money due and paying all bills. He will maintain a record of these transactions and in general handle the financial affairs of the Association. At each regular Board meeting he will provide fiscal status. On a yearly basis a fiscal accounting will be provided to the regular members. The Treasurer and at least one member of the Board of Directors will approve all major expenditures. Initial funding to support mailings and down payments for social events will be provided by voluntary contributions from regular and associate members. Thereafter a rotating fund, supported by social events will be established.

Original Founding Members

Lew Allen, Jr.
David D. Bradburn
Marlin Golnitz
Vernon M. Karlin
William G. King, Jr.
Robert H. Krumpe
John E. Kulpa
Thomas M. O'Neill
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APPENDIX D – QUICK HISTORY OF SATELLITE TEST CENTER (STC)

Satellite Test Center in 1960

Date	***Event***
Oct 29, 1956	Lockheed Missile Systems Division became the primary contractor for the Discoverer/Corona program.
1958	Discoverer/Corona operations begin
1958	First field office was established in Palo Alto for Thor Launch System
1959	Air Research & Development Command established the first military unit charged with conducting military satellite operations. [6594th Aerospace Test Wing]
June 1960	6594th Aerospace Test Wing moved to Sunnyvale. STC built. The DoD purchased 11.4 acres from Lockheed for one dollar to build the STC.
July 7, 1960	Lockheed Palo Alto facility designated Satellite Test Annex [STA] in Sunnyvale.
1962	Satellite Test Annex network consisted of tracking stations as well.
1963	VOB and VOC Mission Control Center Operations began, AF Satellite Control Facility established.
1964	AFSC directed that Space Systems Division's Deputy Commander become the Satellite Control Operations commander. Also named at that time, AF Satellite Control Facility. (AFSCF)
1969	"Blue Cube" built for Manning Orbiting Lab
1971	STA became Sunnyvale AF Station

1977	AFSCF headquarters and staff functions moved to Sunnyvale
1980	OD-1 & OD-4 created
Apr 12, 1981	AFSCF supported first space flight of Columbia.
July 25, 1986	Sunnyvale AFS became Onizuka AFS, then AFB in Aug 87.
Jan 30, 1992	2nd Satellite Tracking Group included 750th Space Group [Sunnyvale] and the 50th Space Wing [Falcon AFB].
1995	Base Realignment and Closure Commission directed the realignment of the 750 SG and Onizuka Air Station.
2000-2006	De-activation [OD-4/DH Apr 2000, OD-4/DZ Sept 2000, OD-4/DC & DM Jun 2005, OD-4/DX June 2006]

Note: VO = vehicle operations, OD = Operating Division
For more information -- http://www.nro.gov/foia/declass/WS117L_Records/266.PDF

This history of SAFSP is dedicated to all those men and women who fought the Cold War, in silence – from above.

No organization in the world is better at gathering intelligence from space than the U.S. National Reconnaissance Office (NRO). As threats to the Nation's security have evolved over the past 55 years, the NRO has responded carefully and quietly to keep national decision-makers informed and aware. Today's NRO grew out of the combined efforts of three government organizations: the Air Force, CIA, and Navy. The Air Force office for satellite reconnaissance was called Special Projects. It was in the Office of the Secretary of the Air Force. Publicly it was referred to as SAFSP.

This monograph describes the creation and life of SAFSP, which essentially represents the birth of Air Force satellite reconnaissance. Because many of those present at the beginning are still alive, recollections and "war stories" are included where available. When SAFSP was created in response to Presidential recognition of a national imperative, four operational tenets captured the sense of urgency: direct access to national leadership, covert management and operations, highest national priority, and rapid procurement. In addition, three management principles led to SAFSP's success over 30+ years of providing reconnaissance intelligence to the Nation: strong dedication to mission, empowerment at all levels, and reporting by exception.

This monograph focuses on recently declassified imaging satellite programs, such as Gambit and Hexagon. The strengths of the "SP" approach could provide valuable lessons for future leaders during national crises.

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