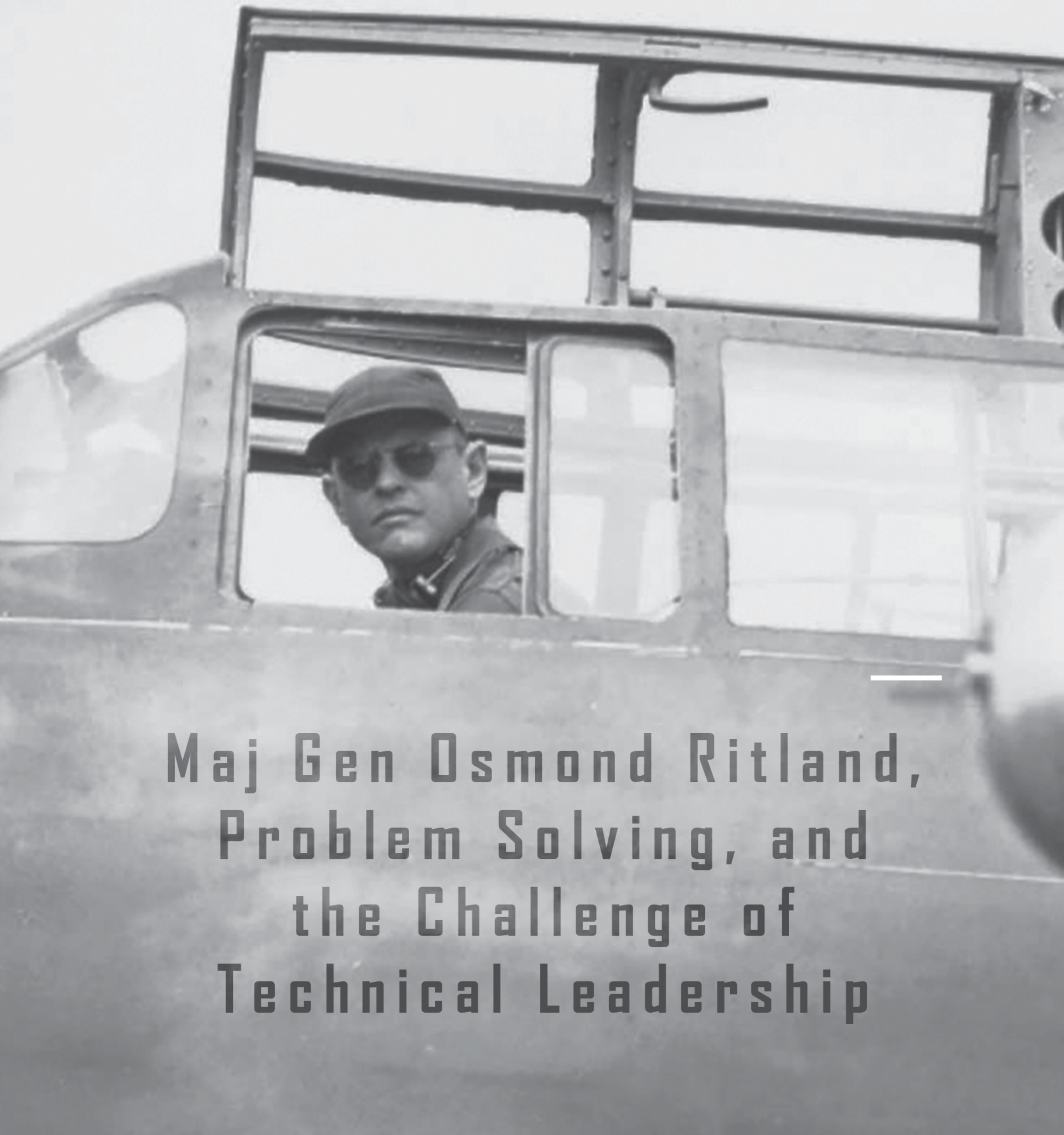
ENGINEERING THE FUTURE

David Christopher Arnold



Maj Gen Osmond Ritland, Problem Solving, and the Challenge of Technical Leadership

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Air University Press
Maxwell Air Force Base, Alabama

Library of Congress Cataloging-in-Publication Data
Library of Congress Control Number: 2026933696
Cover photo: Ritland family photo. Other photos from USAF or DOD unless otherwise noted.

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AUTHOR'S NOTE

A portion of this manuscript appeared as "Problem Solver: Osmond J. Ritland," in *Space Force Pioneers: Trailblazers of the Sixth Branch*, ed. David Christopher Arnold (Naval Institute Press, 2024), used with permission of the Naval Institute Press. Another portion was presented at the 2023 Society for Military History Conference as "Engineering the Future: Test Pilot Osmond Ritland in World War II."

For Mom, my first history teacher

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PREFACE

In 2019, the United States Congress passed and the President signed into law the creation of the sixth branch of the armed services, the United States Space Force. Many Americans giggled when Netflix lampooned the new service because few have any idea how reliant they are on military-provided space capabilities every single day for commerce, entertainment, finance, and the blanket of security under which they live. But inside the US military, which has come to rely on space capabilities that have literally changed the American way of war, the event was extremely important. For the United States Air Force, which invented the word "aerospace" and saw its future as the "Space and Air Force" wrecked, the USSF's creation had the same shocking effect as when the USAF had been cleaved from the US Army in 1947. For the Guardians who are members of the new military service and for those who have worked on military space for decades, the event finally acknowledged their importance in the ever-changing character of war.

Yet despite American military space programs reaching back to 1945 and perhaps earlier depending on how you define "space capabilities," there are few biographies of space leaders, except for USAF Gen Bernard Schriever and military officers who were astronauts. It seems a little obvious that it is time for a biography of a space leader who was present at the creation, making Schriever's first deputy for military space, USAF Maj Gen Osmond Ritland, the obvious choice. The biography of this air and space leader who had a hands-on technical background and outstanding leadership skills can teach lessons to the members of the newest military service.

A quick note about sources: General Ritland died in 1991 and his only official oral history for the Air Force was in 1974, before much of what he worked on in the space portion of his career was declassified. That conversation was mostly about his later years as a leader, and I have filled in the gaps in his pre–Cold War career with other sources. I have also used archival material to fill in the gaps in his space and missile time. For much of the rest of the story, I searched other sources that helped me understand Ritland as a person, the work he did, and the age of tremendous change in which he lived. But where I could, I let Ritland speak for himself.

A longer note about methodology. This is a scholarly book, meaning I use historical methods to outline and support arguments, but it is not simply a book for fellow academics. People in the aviation and space business who were both technically inclined and able to lead others, like Osmond Ritland, created new tools and systems in the twentieth century both to fight wars and to prevent them, changing the world and engineering the future. But although the book generally follows a chronological approach, to make the argument clearer, the later chapters are thematic rather than chronological because Ritland worked on many projects as he got to be more senior. For example, although Ritland was in Los Angeles working on both space and missile programs from 1956 to 1962, these two topics are divided to make them easier to follow. Similarly, his time serving during World War II is roughly divided into his service as a test pilot and his time overseas.

Author Ryan Holiday pointed out that the ancient Roman biographer Plutarch said, “Small events—a single moment, a simple exchange, an unremarkable decision—are what change the world.” Those small events, simple exchanges, and unremarkable decisions are scattered throughout this book because they form the essence of problem solver Osmond Jay Ritland. They also help illustrate the importance of leadership during the revolution in American air- and space power taking place in the middle of the most revolutionary changes in the history of technology.

DAVID CHRISTOPHER ARNOLD
WASHINGTON, DC

INTRODUCTION

"CONFIDENT NONCHALANCE"

When US Army Air Forces test pilot Lt Col Osmond Ritland jumped out of a burning RAF Mosquito bomber over Ohio in March 1943 with a "confident nonchalance" that came from years of experience and preparation, he was not thinking about the revolutionary changes taking place in aviation that he had participated in or would be a part of for the next 20 years.[1] He had a problem to solve at that moment. His airplane was on fire, and his parachute was not fully inflating.

Twenty years later in 1963 when Maj Gen Osmond Ritland received the General H. H. Arnold trophy from the Arnold Air Society, the official service organization attached to Air Force ROTC, for his "outstanding contribution to military aviation and aerospace progress," he had begun to realize the dramatic changes that had taken place over the preceding 20 years.[2] By then leading the Space Systems Division of Air Force Systems Command, Ritland pointed out to the cadets just how much had changed in their lifetimes. In the 14 years since their first conclave in 1948 when Ritland was testing "military novelties" known as jet aircraft, four revolutionary technological developments took place, which, he said, "have characterized aerospace progress since World War II. In addition to jet aircraft, these include: nuclear weapon developments and delivery techniques, ballistic missiles, and—now—space systems." Ritland led and participated in revolutions in aviation propulsion, in the engine transformations that took place even before the jet engine, in commercial aviation, and in space and missile technologies by helping solve problems. Aviators, he said, went "from the Jenny to the jet, from Kitty Hawk to Canaveral, and into space itself."[3] He was not just on the receiving end of these changes—in many cases he was leading them. Osmond Jay Ritland was a pilot and engineer who witnessed and contributed to many of the most remarkable changes in aviation that took place during just the course of his career.

In a September 1985 speech to San Diego State University Air Force ROTC cadets, Ritland talked to the cadets about their "unwritten" futures. When he was their age, he told them, his lifetime objective had been to fly the Boeing P-12, a single-seat, fabric-covered biplane the military called a "pursuit" aircraft whose maximum speed was 189 mph. After some college and flight school, at the age of 24, he achieved that lifetime goal at March Field, California, where he served with the greats of early US Army aviation with names like Arnold, Spaatz, Tinker, and Eaker. Then with his lifetime goal achieved and having to leave active duty during the Great Depression but with no job, his choices were to finish college or to try for an airline position, the latter of which he eventually got. He regaled the cadets with stories of test flying at Wright Field during World War II and testing equipment and nuclear weapons after the war. But he admitted he had never really thought past being a P-12 pilot to flying with the airlines or being a test pilot, that he did not know about jet propulsion or ejection seats or atomic physics or the need for intelligence that eventually resulted in the U-2, or rocket propulsion that made ballistic missiles feasible, or that those same boosters could make space exploration possible. Said Ritland to the cadets, "[I] did not know I would be involved at the very beginning of these military projects." And he was sure they were wondering why he was telling them these stories when they all "knew" how their futures were going to turn out. But, he said, "[You] don't know how your cookie will crumble with time. *Go for it!*"[4]

Ritland earned his wings in 1933 and flew under the command of Henry "Hap" Arnold and Carl "Tooey" Spaatz. After the airmail crisis he left the service in 1935, as many reserve officers did at the end of their hitch, to fly for United Air Lines, mostly on the West Coast, until he went back into the Army in 1939. He spent most of World War II as a developmental test pilot at Wright Field, near Dayton, Ohio, where he flew nearly 200 different types of aircraft and amassed thousands of flight test hours until 1944 when, as a colonel, the Army sent him to India. After the war and a six-month school assignment in Kansas, he returned to the test community at Wright Field, primarily working on development of new jets and the ejection seat. In 1950, the USAF made him commanding officer of the 4925th Test Group (Atomic), the unit responsible for figuring out how to configure and use aircraft for the new nuclear mission, including dropping live nuclear weapons at the Nevada Test Site. One observer said Ritland performed with "a professional's quiet competence."[5] By 1951 he had accrued over 8,000 flight hours, including over 3,000 in commercial aircraft and 2,500 in test flying.[6] After command and another school assignment, Ritland was assigned to the Pentagon to work on nuclear issues and then as the USAF project officer for the U-2 high-altitude reconnaissance aircraft. In 1956, the USAF assigned him to lead its space programs, first as deputy commander to Bernard Schriever and then as commander when Schriever left. Ritland finished his career as director of human spaceflight for the USAF at the time when the air service was trying to figure out how to use pilots in space. After retirement, he joined industry and continued to work on space programs.

It was not enough to be a good engineer or scientist in the post–World War II environment; one also had to be a leader and a manager. Ritland expressed this duality when he wrote in 1960, "One of the central factors of military affairs today is the interaction between strategy and technology. . . . At the same time, the reverse is true—the direction that military technology will take is being determined by the imperatives of military requirements and strategy."[7] As Schriever put it in 1958, "Our job is to help our country and the whole free world to build that deterrent power which I have defined as military power used for the pursuits and purposes of peace. By this means we believe that we can help to gain the time and opportunity for the statesmen of the free world to work out conditions of peace by diplomatic, economic, political, psychological, and other measures."[8] Historian Thomas Parke Hughes points out in his 1998 book, *Rescuing Prometheus*, "Motivated by the conviction that they were responding to a national emergency, they single-mindedly and rationally dedicated the enormous funds at their disposal to providing national defense."[9] Ritland also understood the importance of this approach when he told the 1962 gathering of ROTC cadets that "as warriors for democracy, our common obligation is the defense of freedom. Our best defense today and tomorrow stems from our collective ability to mount an intellectual offensive against the unknowns, the uncertainties, and the inequities existing in the new frontiers of space. Our ability to understand and to use space in positive and productive ways also constitutes our most promising guarantee for peace."[10] He participated in and was a leader of that "intellectual offensive."

When they ran into delays from bureaucratic or political roadblocks, "a crisis mentality, justified or not, helped break the inertia of bureaucracy," whether it was Trevor Gardner in the case of the Atlas program or Sputnik for the American space program.[11] Ritland often operated in that crisis environment in the developmental test programs supporting the needs of World War II or the uncertain environment of the Cold War with Soviet communism. In fact, Ritland was chosen because his leadership skills and engineering background meant he could exercise overall management and control of these huge weapons systems.[12] As Hughes put it, "The unique confluence of military, political, economic, and technological circumstances in the 1950s brought a decade of management and technological achievement that has lastingly influenced the character of American engineering and management."[13] Ritland was often the person who broke the inertia of bureaucracy, as we shall see, as he stood at that confluence and solved the problems of the moment.

Ritland's role was like the many "engineers and scientists playing leading management roles as well as solving research and development problems." Hughes's examples include the Semi-Automatic Ground Environment (SAGE) computer system's use of a "collective management structure now labeled the military-industrial complex." The Atlas intercontinental ballistic missile (ICBM) used a management method called "systems engineering." Both SAGE and the ICBM programs were systems of systems, and the system builders—the engineers like Osmond Ritland—were not "heroic inventors" like Alexander Graham Bell or Henry Ford or even the Wright brothers but team leaders who crossed "disciplinary and functional boundaries—for example, to become involved in funding and political stage-setting." These "system builders" do not focus on "individual artifacts" like the telephone or the Model T or the Wright Flyer but "often preside over the establishment of systems that involve both physical artifacts and organizations."[14] Think of fields of ICBMs or constellations of satellites.

To see Ritland as a problem solver makes his role in the tremendous changes taking place in twentieth-century technology even clearer. As historian James R. Hansen put it in his book *Engineer in Charge*, about NASA's Langley Research Center in the 1950s and 1960s, "The unwritten rule for the work of any engineer is to bring everything to bear on solving the problem of the moment. This means bending every effort, be it cut-and-try, experimental, theoretical, or any combination of the three."[15] This unwritten rule was the Ritland approach to everything he did; he brought everything he had to "solving the problem of the moment." For Hansen, the engineers were in charge.[16] Ritland, too, is not all that interested in basic or scientific research but in solving practical problems to make aircraft and later missiles and then spacecraft useful for national defense. Make no mistake, however, that although he never completed his undergraduate education, Ritland was an engineer. Ritland is thus the personification of Hughes's system builders and Hansen's engineers. This combination is what we shall explore in this book as we see how Ritland helped engineer the future of air and space technology.

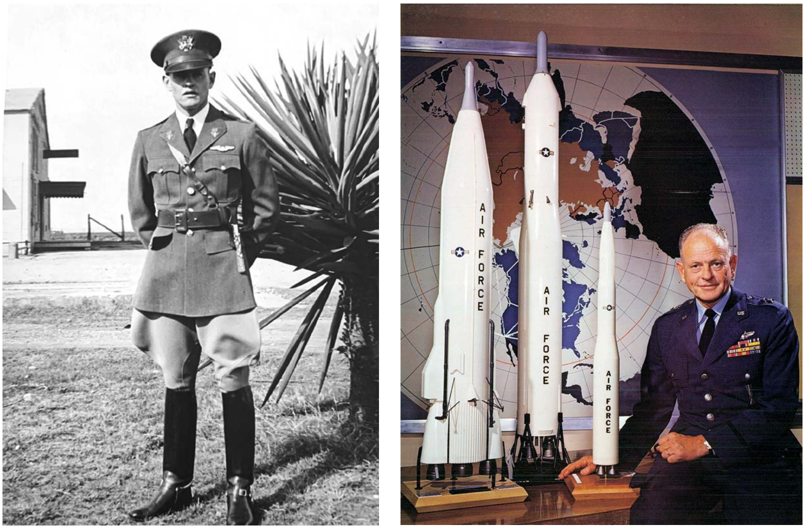

Fig. 1. Osmond Ritland started his career as a second lieutenant in the early years of military aviation (left) and served well into the missile age, as a two-star general (right).

This book, then, is not just about the life of Osmond J. Ritland but is also the story of the revolutions taking place in American air- and space power during a critical period in history, engineered by people such as this exemplary pilot and leader. It is also an example of the importance of leadership in the military during both hot and cold wars. Ritland is every bit proof that high-tech fields still need low-tech leadership.

Notes

1. Douglas Larsen, "Gen. Mills, Col. Ritland Key Men in Training A-Bomb Crews," *The Albuquerque Tribune* 30, no. 24 (May 2, 1952): 1, 10.

2. Ritland official bio, https://www.af.mil/.

3. O. J. Ritland, "Keynote Address to the Arnold Air Society's 14th National Conclave" (April 12, 1962), Ritland papers.

4. Notes for a speech at San Diego State AFROTC Dining In (September 30, 1985), Ritland papers. Emphasis in the original.

5. Vincent T. Ford, "'Twenty-Four Minutes To Checkmate,' 1953–1957," unpublished manuscript, circa 1997, Eisenhower Library, 301–2.

6. Ritland biography, January 26, 1951, 128, Box 2, Misc papers, Ritland papers.

7. O. J. Ritland, "Air Force Missiles," *Ordnance* 44, no. 238 (1960): 576.

8. Schriever before the World Affairs Council, Los Angeles, November 7, 1958, in "Excerpts of speeches," Bernard A. Schriever papers, Box 164, Folder 6, Library of Congress, hereafter Schriever papers. Schriever, the National War College graduate, used the terms "diplomatic, economic, political, psychological, and other measures" to point out the tools available to national leaders on which to build national security strategy.

9. Hughes, *Rescuing Prometheus*, 10.

10. Ritland, "Keynote Address."

11. Hughes, *Rescuing Prometheus*, 77–83.

12. Hughes, *Rescuing Prometheus*, 102.

13. Hughes, *Rescuing Prometheus*, 144.

14. Hughes, *Rescuing Prometheus*, 4–7.

15. James R. Hansen, *Engineer in Charge: A History of the Langley Aeronautical Laboratory, 1917–1958* (NASA SP-4305, 1987), xxxiii.

16. Hansen, *Engineer in Charge*, xxxii–xxxiii. Hansen is building on Thomas Kuhn, *The Structure of Scientific Revolutions* (University of Chicago Press, 1970), and Edward W. Constant II, *The Origins of the Turbojet Revolution* (Johns Hopkins University Press, 1980), 20.

Chapter 1

Learning to Fly

Osmond Jay Ritland was born in Berthoud, Colorado, on October 30, 1909, the youngest son of Osmund O. Ritland (1869–1935), whose parents were Norwegian immigrants who settled in Iowa, and Jane Olena "Jennie" (née Tesdell) Ritland (1880–1957), whose parents were born in Iowa. Osmund and Jennie married in 1900, and their oldest child, Hubert, was born in 1904 with the middle child, Marjorie, born the next year. Young Osmond, who went by "Ossie," was the youngest of the three children.[1] Father Osmund was a house painter for many years. After moving to Boise, Idaho, where they stayed for a few years, the Ritland family settled in the San Diego, California, area sometime in 1920, where Osmund became a chiropractor after graduating from Clewell Chiropractic College in early 1922 at age 53.[2] The May 16, 1922, issue of *The San Diego Union* newspaper advertised his practice at 2304 30th Street in San Diego, about ten miles from North Island, at the end of the 30th Street trolley line that ran from North Park to the ferry to North Island.[3] The family settled in the area known as La Mesa in what were then the foothills east of San Diego, but they were not well-to-do. One descendant remembers Jennie racing pigeons, a popular local institution.[4] Ritland told his daughter a story once of how the family used to make their own soap, and it was the responsibility of young Ossie to roll the bars in paper.[5] The children were all scholar-athletes. Marjorie was on the honor roll. Hubert ran track when they lived in Idaho and was a member of the high school engineers club in their new hometown.[6]

Examining a few major factors that may have influenced Ritland helps set the stage for his story. The first is the tremendous influence the military and aviation had on San Diego in the 1920s as constant feats of aviation daring pushed the evolution of aviation literally to new heights. The second factor is the leadership and technical skills of young Ritland that developed in the community's aviation-charged environment as he graduated from high school and attended college in the early stages of the Great Depression. Finally, there is the drive Ritland showed when he set a goal for himself and tried to achieve it.

San Diego began its journey as a place to live like many California cities and towns did, as an outpost of the Spanish Empire. According to a history of the city written in the 1920s, Juan Rodriguez Cabrillo, a Portuguese explorer working for the Spanish crown, led a crew that sailed two little ships into San Diego harbor in September 1542, having journeyed from Natividad, Mexico, becoming the first Europeans to set foot in the region, just 50 years after Christopher Columbus had "sailed the ocean blue" and reached only the Caribbean. It was another 60 years before more Spanish ships arrived but even longer, another 150 years, before settlers arrived to stay in the 1760s, and even longer before the boom that hit California from the Gold Rush in the 1840s. By the 1880s, San Diego had a population of just 30,000 but was shipping out $1 million in gold bars annually.[7] Over the years as the gold mines failed and agriculture and aquaculture took over, the region's economy shifted. By the 1920s, San Diego's farmers were producing over a million boxes of lemons and oranges and its sailors were hauling in 13 million pounds of fish.[8]

Journalist Joseph Wilson argued at the start of the twentieth century "that San Diego was the ideal location for a naval base 'second to none.' " Unlike San Francisco, it was usually free of fog and major storms and the climate was "neither too hot nor too cold." When finally dredged, the harbor was deep enough to handle the new battleships of the early twentieth century. Because it was so small and still out of the way, San Diego's cost of living was low and labor problems did not plague it like San Francisco. San Diego soon became an important port of call on the Pacific Coast, and with its naval yard with docks large enough for modern fleets and more rail connections with the East, San Diego's life as a naval town began in earnest. Modern fortifications turned the base into a major hub of military activity in California.[9]

San Diego grew into a center of military and naval aviation in the teens and twenties. The terrain of North Island was huge and flat, the local climate was perfect for aviation, and the island had a local city nearby that was easily accessible through mass transportation.

In 1911, aviator Glenn Curtiss opened a flying school on North Island with four aircraft, three with 60-horsepower, 8-cylinder engines and one smaller one for ground training.[10] The next month he landed the "seaplane" alongside the battleship USS *Pennsylvania*, which hoisted him aboard using a boat crane, convincing the US Navy to sign a contract for its first aircraft.[11] In 1914, Glenn Martin, another pilot, airplane designer, and manufacturer, flew there, too. In the runup to World War I, the US Congress appropriated the land and funds for two airfields on North Island: Naval Air Station North Island, where the first aircraft carrier, USS *Langley* (CV-1) was home-ported; and Rockwell Army Air Field, which remained an Army airfield until 1935 when its units, under the command of Lt Col Henry H. "Hap" Arnold, one the first military aviators, moved them to March Field, near Riverside, California.[12]

This period was the beginning of a long military presence on North Island that continues to this day. Both the Army and Navy set up airfields on North Island in 1912, sharing the island with the Curtiss flying school. In November 1913, the Army's site officially became the US Army Signal Corps Aviation School, San Diego, and at least 12 soldiers earned their wings. In addition to dredging out the harbor and building a port for warships, in 1917 the Army built Camp Kearny on Linda Vista Mesa, an 8,000-acre training outpost "where the 40th Infantry Division (California Army National Guard) trained before being shipped to France in World War I." The camp's 1,200 buildings and artillery range overlooking the port of San Diego cost $1.25 million to build but employed 3,500 locals in the runup to the war. Today Camp Kearny is home to Marine Corps Air Station Miramar.[13]

When war broke out in Europe in 1914, Army aviation had been wholly unprepared to "keep the world safe for democracy" with its paltry six airplanes, 12 officers, and 54 enlisted men. The Army organized the 1st Aero Squadron at North Island in 1915 under the command of Capt Benjamin D. Foulois, with a mere eight Curtiss JN-3 "Jenny" biplanes.[14] They saw their first combat not in Europe but in Mexico, supporting Gen John Pershing in the 1916 Punitive Expedition. In September 1917 when Foulois's squadron arrived in France, it did not have any planes and borrowed what it needed from the British, French, and Italians.[15] In 1916, the 2nd

Aero Squadron stood up and then, after training at the North Island flying school, went to the Philippines. In 1917, the Army created the 6th Aero Squadron, sent to Hawaii, and the 7th Aero Squadron, sent to Panama under the command of then-Captain Arnold.[16] Hap Arnold, stationed at Rockwell Field three times, saw the base's evolution. In 1916, he had joined the Rockwell Army team as supply officer for the Aviation School before going to Panama for part of World War I. And by Armistice Day in November 1918, Army aviation had ballooned to 185 squadrons, 8,000 aircraft, 20,568 officers, and 274,456 enlisted men.

By January 1918, aviation had, according to the local newspaper, made "its permanent home in San Diego." San Diego was "the birthplace of naval aviation . . . the only city in America where wives of government officials have been permitted to go aloft in a military airplane" and where "foreign military aviators" had called North Island "unsurpassed by any other aviation site in the world." San Diego journalists were the first to use airplanes to gather news, and San Diego fishermen used airplanes to spot schools of tuna. "Practically every aero squadron in the American service," the *San Diego Union* newspaper boasted, was "commanded by a military aviator who first sprouted his wings at North Island."[17]

The November 1918 air show over San Diego to celebrate the Armistice included 141 Army planes and 71 Navy aircraft that went "through daring feats in mass flight without [a] mishap" and was described by one reporter as a "Wonder of wonders!"[18] Of a May 1919 air show in San Diego on Memorial Day weekend, an historian wrote that the "aerial activity apparently made a lasting impression on the local populace."[19] A similar 1921 Memorial Day event included 500 young ROTC cadets on parade before 2,500 others, including a few of the members of the Grand Army of the Republic, who were veterans of the American Civil War, and "for 25 of the prettiest girls in the high school," including Ritland's sister Marguerite (Marjorie), who was a "sponsor" for the marching band.[20]

In January 1919, Hap Arnold returned to Rockwell Field as the district supervisor of the Western District of the Air Service. The North Island base, renamed in 1917 in honor of Lt Lewis Rockwell, a young pilot killed near College Park, Maryland, in 1912, had grown to about 500 planes and added a pursuit and gunnery school to its flight instruction program during the war. Arnold's job as commanding officer, though, was not to prepare for war but to draw down the wartime Rockwell Field from the 8,000 men and 375 officers at the Army's gunnery school on North Island. After an intervening assignment up the military ladder, Hap returned to a very different Rockwell Field in 1922 as commander of the Western Air Depot, supervising 800 civilians, just nine officers, and a handful of enlisted men, while responsible for supplying and repairing Army aircraft. "There were not many airplanes flying around in those early days," Arnold recalled, but among them were the Fokker T-2, a large, single-wing transport that could carry 3,000 pounds of cargo and eight men. After several tries using a T-2, on May 2 and 3, 1923, Lieutenants Oakley Kelly and John Macready flew the first transcontinental nonstop from Roosevelt Field in New York to Rockwell Field in a trip that took 26 hours, 50 minutes.[21]

Thus by 1920, the year the Ritland family arrived in the region when young Ossie was about 10 years old, San Diego was already a military town. According to historian John Harrel,

> naval activities operating in San Diego in 1919 or budgeted for 1920–1924 included North Island Naval Air Station, Marine Base San Diego, Marine Railroad, Coaling Station, Fuel Oil Storage, Naval Base San Diego, Naval Training School, Concrete Ship Plant, Naval Radio Station Point Loma, Balboa Naval Hospital, and the Naval Repair Station. It was the home port of Squadron 4 and 5 of the Pacific Fleet, the 108th Torpedo Boat Destroyer Flotilla, naval support ships, and Naval Aircraft detachments. The Army was represented by improved gun batteries at Fort Rosecrans, the Air Service Flying School at Rockwell Field (North Island), and Camp Kearny, where the 40th Infantry Division (California Army National Guard) trained.[22]

San Diego's near-perfect climate made it an ideal place to attempt what were considered tremendous feats of aviation as pilots pressed home new ideas about what airplanes could and should be able to do. In 1922, air service Lt Jimmy Doolittle, who had been one of the pilots in the 1919 Armistice air show, completed two record-breaking, long-distance flights by landing at Rockwell Field. In May, Doolittle and Lt L. S. Andrew flew from San Antonio, Texas, in a DeHavilland DH-4, stopping twice in a 12-hour flight averaging 100 miles per hour. Later that year, Doolittle flew in a DH-4 from, Pablo Beach, Florida, to Rockwell, stopping only once for fuel in San Antonio, covering the entire 2,000 miles in 21 hours, 20 minutes by himself.[23]

In June 1923, when Ritland was 13 years old, Army aviators from Rockwell Field, flying specially equipped de Havilland DH-4B two-seat World War I–era biplanes, passed fuel from one plane to another using a 40-foot hose while flying around San Diego. As the supply plane flew above the receiver, a crew member let the hose down through a hole in the floor. Once connected, they passed 50 gallons of aviation fuel before breaking contact and repeating the process the next day. The fog was so bad on the second morning that the refueling was done below 100 feet and then the receiver aircraft went down in a marsh, where it flipped over. The pilots were fine, especially considering they had just set a record for being in the air 23 hours and 48 minutes and 1,991 miles. On their second attempt in August, they stayed aloft for 37 hours, flying 3,293 miles at an average speed of 88.5 miles per hour. It does not seem like much today when bombers fly from the middle of the United States to strike targets on the other side of the world without landing, but in 1923, the feat meant that airplanes could refuel over their home airfield in a safe environment. What followed then was the test of a less benign environment when in October, they tried flying from the Canadian border to the Mexican border, a trip of over 1,200 miles, using refueling aircraft stationed along the way. They succeeded, proving that refueling airplanes in the air could be done, a critical and fundamental skill for modern military aviators. In all, Rockwell Field flyers set 28 aviation records between 1912, when the first government airplane flew over North Island, and 1923, including winning three consecutive Mackay trophies for their aerial skills, which Arnold himself had won in 1912 for a simulated reconnaissance mission that flew between Fort Myer, Virginia; College Park, Maryland; and Washington, DC.[24]

Then in January 1929, when Ritland was 19 years old, the Army launched an attempt at a world endurance record with a Fokker C-2 trimotor transport plane refueled in the air. Led by future US Air Force Chief of Staff Carl Spaatz and including future generals

Ira Eaker, Harry Halverson, and Elwood Quesada along with crew chief SSgt Roy Hooe, the flight aboard *Question Mark* reached over six days in the air, flying long loops between the Los Angeles municipal airport and North Island's Rockwell Field for a total of 150 hours, 40 minutes, and 14 seconds. Refueling specially modified Douglas C-1 biplane cargo planes with 30-foot-long hoses to an airplane without a radio was quite a challenge. Spaatz's crew sent requests to the ground by dropping messages, using flares, or tying notes to the refueling hoses and "received messages by notes delivered by the refueling planes, by means of panels or lights on the ground, and by 'blackboard planes.' The latter were PW-9Ds with sides painted black so messages could be written on them with chalk," according to Air Force historian Maurer Maurer. Communication using the flying chalkboards was simple: "Water-250 gals gas coming up," or to a refueling request, "Message received—ready at midnight." The first blackboard message was a reminder to fly over a particular place on New Year's Day: "Don't forget Rose Bowl," played that year in Pasadena between the University of California and Georgia Tech.[25] The crew also sent down messages like "Please send up a wash-basin . . . We all have gone four days without washing. We are dirty but we like it." Another missive included the comment on dinner: "Last night's dinner was marvelous. We hope there are more like it. We are like contented cows (no milk, however)."[26] The mission finally ended when *Question Mark* lost an engine and could no longer stay aloft, having set an endurance record that would last only a few months until in May 1929 another Army crew broke the record. Less than 12 months later, at the end of 1929, the new record was 420 hours—over two weeks in the air—a record that would also fall eventually.[27] It is no wonder then that the Mackay Trophy, established in 1911 to acknowledge the most meritorious flight of the year, went to aviators from Rockwell Field 13 times between 1912 and 1934.[28] But it was not until 1933 (the same year Ritland got his wings) that the Army finally paved the landing and takeoff area at Rockwell Field, ending the need to cut the grass on the runway.[29]

San Diego had famous visitors, too. In April 1927, former Army and air mail pilot Charles Lindbergh did some training at Rockwell field in the Ryan Aircraft, San Diego–built *The Spirit of St Louis* before his flight across the Atlantic Ocean. He then headed east in May for his 3,600-mile journey. "Lindbergh made 23 test flights over San Diego during an 11-day period."[30] Lucky Lindy returned to San Diego in September 1927 to a welcome from 60,000 people at Balboa Stadium.[31] In 1926, the *San Diego Union* told its readers about the formation of a chapter of the Caterpillar Club, a group of aviators whose lives had been saved by their silk parachutes. The chapter included 18 Army fliers, four civilians, one woman, one Marine sergeant, and one Air Service cadet named Charles A. Lindbergh.[32] When Ritland was 18 years old, a 1928 air show to celebrate the opening of the new San Diego airport, still called Lindbergh Field today, featured "an armada of 222 planes in the air—140 from the Navy, 82 from the Army—with most planes taking off from North Island, all passing together over the new airport and the 50,000 watching citizenry and dignitaries."[33]

San Diego was also the site of aviation moviemaking like the 1927 silent film about World War I pilots called simply "Wings," Frank Capra's 1929 film "Flight," about Marine aviators, and Howard Hughes' 1930 spectacular "Hell's Angels."[34]

East of San Diego in the El Cajon valley, agriculture was the principal industry, producing and shipping in 1909 over 11 million pounds of fruit and another 6 million pounds of produce. A new community named Grossmont grew up in the teens, according to contemporary author Clarence Alan McGrew, "developed by Col. Edward Fletcher and W. B. Gross, from whom the big hill took its name. The region soon needed a high school to support the growing families, and Grossmont Union High School opened in 1920. Their mascot was, and still is, the 'Foothillers.' "[35]

At Grossmont High School about four miles east of their Palm Avenue home, where he was in the class of 1927, Ritland eventually emerged as a leader. He played forward on the basketball team, which went undefeated his senior year for the fourth year in a row, winning the Class "B" Southern California Championship by beating Fullerton High School at the USC Coliseum in Los Angeles. He also served as vice president of the Boys Federation, a kind of school council that supported the Grossmont community with committees on athletics and entertainment for the school, including the Father and Son banquet in March 1927, "which was a decided success," according to the high school yearbook.[36] While he was in high school, Ritland also started dating an underclassman named Martha Virginia Alsup, three years his junior.

An aviation enthusiast—and who wouldn't be growing up in San Diego in the 1920s?—he worked at North Island as a manual laborer for a while, likely taking the trolley from eastern San Diego and then the "nickel snatcher" ferry across the water, a trek of about 20 miles each way.[37] He may have worked at either the Navy base on the north side of the island or the Army's Rockwell Field on the south side at a time when all the landing fields on the island were still grass fields. But instead of working, he recalled, "all I did was watch the airplanes, so I was totally and completely wrapped up in aviation from day one, and it's been good."[38]

After a year off after high school, Ritland entered the state college in San Diego (now known as San Diego State University) in 1928. His application to the Air Corps Engineering School in February 1940 indicates he attended SDSC from 1928 to 1931, majoring in mechanical engineering for three years. There were just five students in the mechanical engineering program at the time, according to the university's archives. While there he took general and advanced physics courses and a course in electrical measurement as well as elementary calculus and college chemistry. He had a materials of construction course, one year of surveying, and in an electrical engineering course he studied electricity and electrical measurements. This course is listed in the 1928 SDSC course catalog as Elements of Electrical Engineering. Topics in the course included "single and polyphase circuits, power-factor, reactance, generators, motors, transformers, and transmission of power." The prerequisites for the EE course were Math 3A-3B, which according to the catalog included topics in "the fundamental ideas of differential and integral calculus" as well as "analytic geometry, differential of algebraic and transcendental functions" and a "wide range of applications."[39]

A class in applied mechanics, which Ritland probably took in the fall of his second year if he proceeded on schedule, included such topics as "the action of external forces on rigid bodies; composition and resolution of forces; equilibrium; rectilinear motion' acceleration, linear and angular; harmonic motion; translation and rotation;

moment of inertia; kinetic and potential energy; work, power, friction; machines; efficiency" and required him to have already passed math and Physics 1C (general physics on topics like magnetism, electricity, sound, and light). Textbooks Ritland used, according to his Air Corps Engineering School application, included *Analytical Mechanics for Engineers* by Fred Seely and Newton Ensign and probably *Aerodynamics* by Charles Monteith and Clifton Carter, both texts used by generations of engineering students.[40]

He also played intercollegiate basketball.[41] In the 1930 yearbook covering academic year 1929–1930, Ritland shows up as a frequent high scorer for the SDSC Aztecs in an age when collegiate scores rarely reached 40 points by a side.[42] In 1930, he was captain, and the team was "looking forward to what may prove the most successful season in the basketball history of San Diego State college," although Ritland was "the only regular of last year's string to return the hopes of a championship."[43] Previewing the upcoming University of the Redlands–San Diego State matchup, the San Bernadino newspaper in 1931 described Ritland as "the backbone of the Aztec attack," though Redlands won 43–25, SDSC's first defeat of the season.[44] That year he also ran unopposed and was elected secretary of the college student council.[45]

It does not appear Ritland ever completed his college degree, however. His 1954 biography in the archives of the Industrial College of the Armed Forces (ICAF), which he attended in 1953–1954, shows under college "No Degree," but one was not required to attend ICAF at the time.[46] One journalist suggested that "the lure of flight was stronger than the attraction of a college degree" since Ritland joined the Army as a flying cadet in spring 1932, during what would have been his third year at San Diego State.[47] It is also possible that he simply ran out of money and could not afford to finish the degree during the depths of the Great Depression.

A radio spot Ritland might have heard recruiting young men for Army aviation in 1931 might have been scripted like this one, found by historian Rebecca Cameron Hancock in the USAF's archives:

> The saying is often heard that "life in the Army is just one school after another." I think that applies most aptly to the Air Corps itself, with its schools for officers, enlisted men, pilots, mechanics, photographers, radio operators or for any

> other pursuit necessary to the proper education of the personnel that make up this [e]ver-growing branch of our country's defense. Now, not only are these schools an important part of the Air Corps training system but there must not be forgotten the follow-up of continued training in these subjects with the Air Corps troops at tactical stations and during maneuvers in the field.[48]

Wanting to be a pilot since at least age 14, Ritland tried joining the Army aviation training program, sending a letter just before he turned 21 in October 1930 to the adjutant general in Washington asking for an application to become a flying cadet.[49] (Candidates had to be at least 20 years old and have a high school diploma or equivalent.[50]) Having no success in joining the flight training program by directly applying, he joined the California Army National Guard in San Diego in May 1931 at 22 years old as a radio serviceman and eventually reached the rank of corporal. He worked for a captain who wanted to push people toward the air service and who wrote letters on Ritland's behalf, which he felt later "were very instrumental" in getting an assignment in the flying cadet program.[51] The 1930 US Census shows Ritland living at home and working as a radio store clerk.[52]

Among Ritland's papers is an Army pamphlet dated 1928 called "Flying Cadets of the Air Corps[:] Aviation as a Career." The pamphlet describes aviation as a "fascinating career to the young man of good education, sound health, and keen spirits." In addition to operational flying for the Army, the air mail, or the "aerial transportation lines, the manufacturing and engineering phase of aviation is in a healthy condition. The building of airplanes and accessories requires the services of a number of competent designers, test pilots, and the like, as there is a special demand for men who, in addition to their engineering qualification, are also pilots." The pamphlet describes the courses flying cadets took, where they occurred, how long they were, and the process of applying to the program. The pamphlet notes pay was $75 per month plus $1 per day for food during training. After graduation, a new Army second lieutenant could expect to make $125 per month at a time when the average American factory worker earned about $71 a month.[53]

In Ritland's later recollections, he simply applied for flying training, was rank ordered by the Army according to certain qualifications, and eventually was offered a spot in a flight training class. The Air Corps "relied on the built-in urge of young men to fly for its recruiting in those days," he recalled, and "I had an awful urge to fly."[54] Although he was not a college graduate, Ritland's National Guard time probably helped him pass the first challenge. When the Army finally called him, the next challenge was the physical, and only he and one other candidate passed of the eight there the day of his physical.[55]

In the early 1930s, Randolph Field was the home of the Air Corps Primary Flying School. It was the first US base purpose-built to be an air station and was laid out differently than most Army bases of the period, on a wheel pattern with the officers' club at the center of spokes that were broad boulevards lined with buildings. Everything was linked and the base was even electrified with underground wires crisscrossing the base, which was landscaped with local vegetation. By 1936 it had four airfields surrounding the wheel of buildings. Randolph Field was known as the "West Point of the Air" because of its basis in education and because its graduates became commissioned officers with the same rank as US Military Academy graduates.[56]

Pilot training classes were made up of young men who came from every corner of the country with backgrounds that were rarely alike. But, as General Arnold put it in his 1942 book, *Army Flyer*, "the flying school did not inquire or gauge them by family or background; it merely inquired if they had the physical setup, mental alertness and the right attitude to make Army airmen."[57] For the first month, Ritland and his classmates were known as "dodos," like the extinct, winged birds that could not fly. This was the period of orientation into military life when they were generally restricted to barracks, with inspections and square sheets and neat foot lockers but no flying. Dodos who failed at something received a demerit, and every five demerits earned an hour walking around the barracks. A dodo's day began at 4:40 a.m. with a one mile run. But at least the food was good. The daily uniform was a blue jacket, called a blouse, a dark gray shirt, and pants usually belted with a black leather belt. Pay for flying cadets was set at $75 a month.[58]

After the initial month of dodo status, Ritland's schedule added flight training. Waking at 6 a.m., breakfast, and assembly by 7 a.m. Then it was off to the flight line if the weather was good. They often flew in the morning and had ground school in the afternoon, when the weather in San Antonio was not as conducive to flying. After ground school they had athletics then supper around 5:30. Some evenings they even returned to the flight line for night flight instruction. Lights out in the barracks was 9 p.m.[59] For this first phase of flight instruction, life was fairly regimented.

The first eight months of primary flight school at Randolph Field consisted of about 75 hours in the air and classes in navigation, structures, engines, propulsion, propeller maintenance, and navigation, among others. The textbooks were also used in colleges at the time, and Ritland found the books on weather and aviation navigation were the same ones he had used at San Diego State College.[60]

Flight training took place primarily in the Consolidated Aircraft PT-3 and -3A, a two-seat primary trainer that was a low-powered, open-cockpit biplane with few instruments. Here Ritland mastered the fundamentals of flying, learning about basic formation flying, night flying, instruments, and radios, always depending on the weather. Former instructor pilot Noel Parrish remembered flying training as "the most pragmatic type of training I have ever seen; you just did what worked," which was especially important in primary flight training because, according to historian Hancock, "few of the fledgling pilots had even climbed into an airplane before beginning flight training."[61]

Ritland's next transition came October 16, 1932, when he and the remaining members of the class moved to the advanced flight school at the older, World War I–era Kelly Field, also near San Antonio.[62] He had entered training at Randolph with 203 other men, but only 92 advanced to Kelly.[63] Kelly was not the luxurious Randolph but more austere. Its old shacks held administrative offices and wooden World War I hangars still sat next to the open grass fields that were its runways. The dirt was everywhere, "causing formation flights to kick up huge clouds of dust and giving new meaning to the term 'blind flying.'"[64]

But Kelly Field was a step up into operational aircraft from training planes and into new skills like cross-country flying, aerial gunnery, and special training in a particular mission, which for Ritland was going to be pursuit aviation, what today we would call fighter jets.[65] Here Ritland flew mostly Boeing P-12Bs and P-12Ds, the main aircraft for new pursuit pilots.[66] Recalled Ritland's contemporary Beirne Lay Jr., "Hitherto, we had been taught to fly, nothing else. Now, the underlying fact was emerging into our foreground that we had learned to fly an airplane for one reason only, to use it as a weapon."[67] Cadets ended up in a specialization partly based on their own choice and partly based on evaluations of their instructors during basic flight training. Some chose bombers because they wanted multi-engine ratings for later career prospects, others chose attack or pursuit, which was "almost universally acknowledged [as] the most glamourous specialty."[68]

Many of the flight instructors were World War I pursuit pilots—the "goggle and scarf" crowd, Ritland called them—but they were "exceedingly good . . . demanding in precision," which was necessary because in those days, pursuit pilots flew as close together as fighter demonstration squadrons do today. Often a pilot and two experienced cadets would take off on a training flight. "We'd fly around and the instructor would wiggle his wings and we'd stagger back, and he'd land in some field that you never knew where it was. Then you'd come in and land and park beside him, and he'd give you the thumbs up and take off again and go over and land someplace else. . . . It was absolutely phenomenal the freedom we had."[69] An instructor at Kelly Field, George Beverley, "recalled leading groups to Love Field near Dallas during the day, eating supper, then, at dusk, having the students take off individually for a return to Kelly after dark. The students could rely partially on their compasses but their primary route indicators were lights on the highway and beacons at the various emergency fields along the way."[70]

Accidents and death were part of the flying training business in those days just like they are today. "By mid-1937, of some 2,051 cadets entering flight training at the Advanced Flying School, thirty-nine had died in aircraft accidents. One 1933 cross-country flight from Fredericksburg to Kelly ended in tragedy when Flying Cadet Charles Rogers crashed his O-2 in fog shortly after take off."[71] As Beirne Lay pointed out later, "This was no kid's game. . . . It could be as cold and hard as steel."[72] And the prospects were not very long-term, either. At the graduation ceremony for the class getting their wings in summer 1932, which Ritland most likely attended, Maj Gen Benjamin D. Foulois, then chief of the Army Air Corps, warned the new pilots that in the midst of the Great Depression's impact on the military, they were likely to be told to leave the military by that time the next year.[73] For Ritland, that meant being out of the military by spring 1934.

At his own graduation February 24, 1933, Ritland received a reserve commission in the Army, earning the coveted gold bars of a second lieutenant and a pay hike.[74] The ceremony consisted of bands, speeches, a parade, and an overhead pass-in-review by bomber, pursuit, attack, and observation aircraft.[75] In addition to getting their military wings all the members of the class earned the civilian rating of "Airplane Pilot." But the ceremony was somewhat overshadowed by the death of their classmate just 10 days before graduation. Paul Viar died "on the final lap of his maintenence [sic] cross country [flight] when his motor was heard to be [misfiring] by persons living in the vicinity of the crash, shortly before his Curtiss P-1 Hawk fell to the ground."[76]

After graduation, Ritland was assigned to March Field in Riverside. He joined the 95th Pursuit Squadron as what today we would call a fighter pilot, flying the Boeing P-12, an open-cockpit biplane with wooden, fabric-covered wings, and then the Boeing P-26, an open-cockpit monoplane with fixed landing gear that was delivered to the Army in late 1933.[77] There were "a few old-timers, officers and enlisted men as a nucleus," Hap Arnold recalled of the base, "and many of our mechanics had recently been graduated from the Technical School at Chanute Field, but mostly, our personnel was made up of raw recruits. Most of our pilots were recent graduates from the Advanced Flying School at San Antonio. As for aircraft, we had a small number of Curtiss 'Condor' B-2's, Keystone B-4's, B-5's and B-6's for bombers, and a miscellaneous collection of planes for our Fighter Group; mostly P-12's."[78] The arrival of Ritland and his cohort was a big enough event that it made the local newspaper when the group of 22 new second lieutenants reported to March Field.[79]

The area around March Field was perfect "from the flying point of view," according to Hap Arnold. Large expanses of terrain meant there were great distances available for practicing tactics, techniques, and procedures. As Arnold recalled, "Flights starting from the baked plains of March Field could soon be over hot deserts, the high mountains, the great salt flats, and the Pacific Ocean. Thus, we were able to take advantage of rugged training conditions impossible in the East." In the winter of 1932–33, when blizzards crushed the Southwest, local leaders asked Arnold if they could help from the air. Said Arnold, "We had never been confronted by such a problem, but I said, 'Yes.'" Using commercial airports between Kingman, Arizona, and Amarillo, Texas, they dropped commodities to isolated communities and located Native American villages buried in the snow, which pilots then "bombed . . . with food" in an operation that Arnold thought of later as "dress rehearsal for the great Berlin Airlift (Operation Vittles) fifteen years later."[80] Arnold recalled that "during the next four years I put crews, and whole squadrons, on airdromes away from their home stations for weeks at a time, under field conditions which no other American airmen were to know until Brereton's units joined Tedder and Coningham in time for [the battle of el] Alamein [in 1942]."[81]

For Ritland, this began a period of "tactical unit training," when pursuit pilots had advanced training in formation flying, aerial navigation and employment, night flying, ground attack, aerial gunnery and bombing, cross-country flying, and field exercises with their fellow soldiers in ground units. In the classroom, either because flying hours were at a premium or because the weather was bad, they spent time on the "theory and practice of bombing, aerial navigation, meteorology, oxygen equipment, organization, supply and maintenance, night flying, air tactics, parachutes, engineering, Field Service regulations, combat orders," and they had lectures on special topics like the roles of the other branches of the Army and how federal troops could be used in civil disturbances.[82]

As overall base commander, Arnold had the challenge in 1931 of transforming the sleepy postwar training base into a massive operational aviation unit consisting of a bombardment group and a fighter group. By the time Ritland arrived, March Field had undergone a lot of construction. According to March Field historians Bruce Harley and Claude Heitman, "Sufficient structures and family housing units were available [by 1933] so that March [Field] began to take on the appearance of a permanent Army post" in the valleys east of Los Angeles, including a paved asphalt runway instead of a grass airfield.[83]

Social life was an important part of being an Army officer in the 1930s. They were expected to attend events like the one on Friday, January 26, 1934, which featured small dinner parties at the homes of one of the host officers followed by a dance at the Officers Club. Ritland went to the home of Lt and Mrs. Kerwin A. J. Malone where the guest of honor was Mrs. Felix Emmennuelii of Omaha, Nebraska. According to the local newspaper, the *Riverside Daily Press*, "The tables were prettily decorated with bouquets of sweet peas and snap dragons in shades of green and yellow and yellow candles cast a soft glow on the guests." With the hosts there were five other married couples and three other officers, including Ritland.[84] Or perhaps on another occasion Ritland visited the Riverside, California, Mission Inn, where Hap Arnold had been present in December 1932 at its Saint Francis Chapel for the dedication of the International Shrine of Aviators.[85]

In modern terms, as a lieutenant colonel, Hap Arnold was the commander of two air wings performing two different operational missions on a single base with a third, geographically separated unit at Hamilton Field near San Francisco, the 7th Bombardment Group. In the 1950s, when the Air Force was an order of magnitude bigger, he might have been an air division commander in a one-star billet. In the twenty-first century, he would have still probably have been a full colonel or even a one-star general with overall command of one wing while providing mission support to the other. A close modern comparison is probably Minot Air Force Base in North Dakota, which hosts two operational units with similar but different missions. The bombardment group at March Field was under the command of Maj Carl Spaatz and had three bomb squadrons flying Condor B-2 and Keystone B-4 aircraft, which were soon replaced with newer Martin B-10 Bolo bombers. Two pursuit squadrons, which included Ritland's unit, flew Boeing P-12s, which were soon replaced by the Boeing P-26 Peashooter.[86]

In the 1930s, both the Army and the Navy flew the P-12 (the Navy designation was F4B). Early versions used fuselages of bolted aluminum tubing covered in fabric but the 20-foot-long, 30-foot-wide P-12E and F used an all-metal, semimonocoque (stressed skin) construction for the fuselage, making it sturdier for the stresses of fighter maneuvers. The P-12 was never an all-metal aircraft, however, because it had wooden wings covered in cloth. It was armed with two .30-caliber machine guns and powered by a single, Pratt and Whitney 500 hp engine capable of taking the aircraft to 26,000 feet and a cruising speed of 160 mph. It was the last of the biplane fighters the Army flew, though some P-12s remained in service until 1941. Boeing produced 366 P-12s for the Army, with more P-12Es built (110) than any other version.[87] It was Ritland's first operational aircraft.

Fig. 2. Young Ritland stands by a P-12, the first operational aircraft he flew.

Ritland flew with a mix of officers who went on to lead American military aviation into the next war and to the eventual creation of an independent service. Historian and retired Maj Gen Mike Worden describes two generations of World War II leaders who changed the air service. The "senior World War II generation" was largely officers, commissioned at West Point between 1926 and 1932, who "viewed themselves as an elite group, a privileged few who had entered a realm of great future potential," aviation. They were well-educated (94 percent of the four-stars had a college degree) and 59 percent attended the Air Corps Tactical School, the Army's center for development of high-altitude precision daylight bombing. Among those senior officers at March Field in the 1930s were Arnold, Tooey Spaatz, Curtis LeMay, Tommy Power, and others. Ninety percent of the "senior generation" became general officers, and most finished the war in just their late 30s. What Worden called the "junior World War II generation," though, joined the service after 1932. Many of them made colonel, although less than half became combat squadron commanders and just 7 percent became combat wing commanders by the end of the war. In addition, less than half the post-1932 group were West Pointers and more than a third started as aviation cadets. Many of them had no college degree.[88] Among this second group of officers were Ritland, Bernard Schriever (who did have a college degree), and others.

Many of those people who surrounded Arnold were part of the "West Coast Air Force," so-called by people like Clair Peterson, who arrived at March Field in 1934 as a newly minted pilot. Peterson recalled later that "in the early [history] of the Army Air Forces, there were sort of two air forces, you might say, in that there was the East Coast and the West Coast. The West Coast seemed to have a pride in their people. People didn't seem to be transferred back and forth between coasts so much; they'd be transferred within the East Coast or the West Coast. . . . Arnold was more familiar, naturally, with these people out here in the West, people who had been with him for years."[89] People like Osmond Ritland.

Although aviation was very dangerous, the life of a military flyer in the 1930s was not tough. Officers normally arrived for work around 7:30 a.m. for a flight day that may begin about 8 a.m. and went until lunch. A break of 11:30 to 1:30 at the officers' club was common, followed by a few more hours in the office, hangar, or on the flight line. They even had Wednesday afternoons free and nearly everyone had free weekends except when they were on maneuvers, which for pilots usually meant long flights when they could not get back to base on the same day, like at the Muroc gunnery range in central California. Officers lived in quarters on base and shopped at the commissary and base exchange at rates discounted from the local community. The price difference sometimes made up for the reduced pay rates they were enduring during the Great Depression. President Hoover had mandated unpaid leave while President Roosevelt mandated a 15 percent pay cut for the military until 1935. Still, officers did have regular paychecks at a time when almost five million families depended on private charities or the government just to survive.[90]

The US Army Air Corps of the 1930s was also not completely devoid of flight hours, but they were pretty thin nevertheless, which led to accidents for pilots, including Ritland. Seven months after he had graduated from flight school, Ritland had amassed just 232 hours in the P-12, an average of fewer than 10 hours a week in his primary aircraft. Over July, August, and September, he had averaged 23 hours a month, about six hours a week, likely flying just twice a week. As he prepared to take off on October 4, 1933, at 6:15 p.m. for his first experience in night formation flying, calamity struck. The weather was good when Ritland, solo in the far-right position of an element of three P-12Fs, swung the aircraft left and into the prop wash of the flight leader. In the twisting air created by the leader's propeller, Ritland pulled back on the throttle but "ground looped to the right" according to the accident report. The result was a rapid turn of the P-12F in the horizontal plane, also called yawing, while still on the ground, which caused the lower left wingtip to dip until it touched the ground. Unfortunately, the plane was a "complete wreck" because the damage was a "broken lower left wing tip (rear spar and ribs)," catastrophic for the wooden, fabric-covered wings. According to the official report of the accident in Ritland's papers, the fault was 100 percent Ritland's, who used "poor technique."[91] But he suffered no ill effects physically or professionally and returned to flight status. That would not be true of other accidents he would be involved in later in his career.

The Boeing P-26 replaced the P-12 starting in late 1933. Nicknamed the Peashooter by its pilots, the P-26 was 30 mph faster than its predecessor and nimbler as well. It was also constructed of all metal, unlike the wood and fabric P-12. Its single Pratt and Whitney Wasp engine put out 500 hp, and it could reach over 27,000 feet, where temperatures can reach 40 degrees below zero. The Peashooter remained the Army's top fighter into the late 1930s.[92] On one occasion Ritland's unit went with 18 P-26s to Muroc Field to practice gunnery during the day and then night flying, but the lack of lights in the desert made the conditions very hazardous when they could not tell how high they were above the dry lakebed. Using only gun cameras because ammunition was at a premium, they practiced their air-to-air skills during the day. While there, the squadron lived in field conditions of tents and messed in the outdoors.[93] Flight time remained limited, though, because of the Great Depression's pressures on military budgets, and Ritland did not get as much practice in air-to-air combat as he wanted.[94] But back at March Field, Ritland did manage to fly down to the San Diego area from time to time and buzz the house of Martha Alsup, a young woman he had known since high school.[95]

Notes

1. John Ritland, "Ritland Family History," c. 1996, https://ritland-32nd-iowa.com/, accessed September 26, 2022; 1910 US Census; 1920 US Census; 1930 US Census; and "Gen Osmond Jay Ritland," Find A Grave, https://www.findagrave.com/, accessed June 29, 2022. Ritland's burial site is Fort Rosecrans National Cemetery, San Diego, California. His wife, Martha Alsup Ritland (1912–2008), is buried with him. Ritland always used "Ossie," never "Ozzie," but z's will be used here when directly quoting others' writing about him.

2. "Clewell Chiropractic College Will Hold Exercises for Largest Class Ever Graduated From Institution," *The San Diego Union* (February 26, 1922), 7. The 1920 US Census for Boise, Idaho, shows the Ritland family still living there. The 1930 Census shows the Ritland family at 424 South Palm Avenue in the San Diego neighborhood of La Mesa, but Ossie was the only child still living at home.

3. "Business and Professional Directory," *The San Diego Union* (May 16, 1922), 16.

4. "Palomar Loft Wins Homing Pigeon Race," *San Diego Union and Daily Bee* (August 4, 1920), 10, California Digital Newspaper Collection.

5. Kathleen Ritland Montoya, interview with the author, June 29, 2022; and Kathleen Ritland Montoya, email to the author, Subj: "Re: Your grandfather in the newspaper," November 10, 2022.

6. "Boise-Baker Track Meet Opens Friday," "Report Cards Issued," (Boise) *Capital News* (November 9, 1919), 5; and "Engineers Club Meets," (Boise) *Capital News* (November 2, 1919), 5, https://www.loc.gov/. The 1940 US Federal Census shows Hubert as a college math professor at Idaho State University in Pocatello, Idaho.

7. Clarence Alan McGrew, *City of San Diego and San Diego County: The Birthplace of California*, vol 1 (The American Historical Society, 1922), 1–3, 129–30, http://books.google.com/, accessed September 21, 2022.

8. McGrew, *City of San Diego*, 374–77.

9. Wilson quoted in John S. Harrel, "San Diego, Guardian of the American Pacific," *Southern California Quarterly* 95, no. 1 (2013): 57, https://www.jstor.org/.

10. Wallace R. Peck, "Forgotten Pioneers: The Army's Rockwell Field at North Island," *Journal of San Diego History* 52, no. 3 (2006): 104–5.

11. Katrina Pescador and Mark Aldrich, *San Diego's North Island 1911–1941* (Arcadia Publishing, 2007), 12–15.

12. Pescador and Aldrich, *San Diego's North Island*, 7, 20–21, 56.

13. McGrew, *City of San Diego*, 220–21; and Harrel, "San Diego, Guardian of the American Pacific," 78–79.

14. Captain Nancy Welz Aldrich, "The 1st Aero Squadron—A History," First Aero Squadron Foundation, no date, https://firstaerosquadron.com/, accessed September 21, 2022.

15. Peck, "Forgotten Pioneers," 110–11.

16. Peck, "Forgotten Pioneers."

17. "San Diego Leads the World in Aviation," *The San Diego Union* (January 1, 1918), 7.

18. Peck, "Forgotten Pioneers," 112; and "Great Pageant of Sky Makes Aerial History as Fliers Circle Over City," *The San Diego Union* (November 28, 1918), 1.

19. David K. Vaughn, "Hap Arnold's Bill Bruce Books: Promoting Air Service Awareness in America," *Air Power History* 40, no. 4 (1993): 47; and "G.A.R. Veterans Refuse to Ride in Memorial Day Parade; Would Walk With Comrades in March," *The San Diego Union* (May 24, 1919), 5. During this particular parade, Hap Arnold, who commanded Rockwell Field at the time, marched with his staff and 250 servicemen while airplanes overhead dropped flowers on the veterans of four American wars going back to the Civil War, who were organized into the Grand Army of the Republic but refused to ride in cars during the parade, preferring to march like military men, though many were well into their 70s by then.

20. "500 Young Americans Pass in Review Before Grand Army Men," *San Diego Union and Daily Bee* (May 28, 1921), 9, California Digital Newspaper Collection.

21. H. H. Arnold, *Global Mission* (Harper and Row, 1949; TAB Books edition, 1989), 45, 88–89, 107–9. The quoted text is on p. 108. Arnold's memoir refers to Mitchel Field instead of Roosevelt Field on Long Island.

22. Harrel cites the San Diego Chamber of Commerce's annual report for 1919 on pp 78–79.

23. Peck, "Forgotten Pioneers," 114; "Army Aviators Land Here Safe After Long Trip," *The San Diego Union* (May 5, 1022), 1; and "Two Fliers Make Texas-To-Coast Trip, 12 1/2 Hours," *The San Diego Union* (May 6, 1922), 6.

24. Maurer Maurer, *Aviation in the U.S. Army, 1919–1939* (Office of Air Force History, 1987), 183–84; H. H. Arnold, "The History of Rockwell Field," unpublished manuscript transmitted to Air Corps chief Maj. Gen. Mason Patrick (February 6, 1924), AFHRA, IRISNUM 00124762, 113–21; and Dik Alan Daso, *Hap Arnold and the Evolution of American Airpower* (Smithsonian Institution Press, 2000), 57.

25. Maurer, *Aviation in the U.S. Army*, 260–65.

26. Maurer, *Aviation in the U.S. Army*, 263; and "Army Plane is Fast Nearing New Air Mark," *San Pedro News Pilot* 1:263 (January 5, 1929), 1–2, California Digital Newspaper Collection.

27. Maurer, *Aviation in the U.S. Army*, 264–65. One of the *Question Mark* airplanes had been delivered to Rockwell Field by a Norwegian aviator named Bernt Balchen, first pilot to fly over the North and South Poles. Bernt Balchen, *Come North With Me* (Dutton, 1958), 213.

28. Peck, "Forgotten Pioneers," 122.

29. Peck, "Forgotten Pioneers," 116–17.

30. Peck, "Forgotten Pioneers," 118.

31. Katrina Pescador and Alan Renga, *Aviation in San Diego* (Arcadia Publishing, 2007), 77.

32. Ed Leiser, "Draft San Diego Flying Days, Book Nine, 1926, Chapter 104 (JUL)" unpublished manuscript, Ed Lesier Collection, San Diego Air and Space Museum, Box 2, Folder 12. There are literally thousands of entries about things flight-related going on in San Diego. He recorded events from the *San Diego Union* newspaper, logbooks, and other sources.

33. Peck, "Forgotten Pioneers," 118; and Pescador and Renga, *Aviation in San Diego*, 78.

34. *Wings*, https://www.imdb.com/; *Flight*, https://www.imdb.com/; *Hell's Angels*, https://www.imdb.com/, all accessed July 9, 2022. The 1938 movie *Test Pilot* starring Clark Gable, Myrna Loy, and Spencer Tracy was filmed at March Field. See "Test Pilot," https://www.imdb.com/; and Marge Bitetti and Tony Bitetti, *The Aviation History of Greater Riverside* (The History Press, 2013), 77–78.

35. Donald J. Ginn, "A Look Back," Grossmont High School Museum (Summer 2006 and updated 2018), https://www.foothillermuseum.com/, accessed July 11, 2022.

36. Osmond J. Ritland oral history March 19–21, 1974, with Lyn R. Officer, 1, Air Force Historical Research Agency (hereafter Ritland oral history). Articles on basketball and the boys' federation appear in the 1927 Grossmont High School yearbook, *El Recuerdo* (*The Memory*), provided to the authors by Connie Baer and Lynn Baer, GHS museum directors, https://www.foothillermuseum.com/, accessed July 1, 2022. Three astronauts have graduated from Grossmont High School: Bill Anders (Apollo 8), Ellen Ochoa (four shuttle missions), and Fred Sturckow (four shuttle missions and Virgin Galactic test pilot). Sean Jones, "A Century of Foothillers 1920–2020" (n.d.), 44.

37. "It once was called 'Nickel Snatcher'," *Coronado Eagle and Journal* 45:30 (July 24, 1958), 4, California Digital Newspaper Collection; and Mike Reading, President, San Diego Electric Railway Association, email to author, Subj: "Re: SD Railways," April 2, 2023.

38. Ritland oral history, 1, 5–6.

39. Memorandum for Lt. Osmond J. Ritland, A.C., from Ralph P. Swafford, 1st Lt, Air Corps, No Subj [Application for Air Corps Engineering School], February 5, 1940, Ritland Papers, 412th Test Wing archives, Edwards AFB, California (hereafter Ritland papers); and San Diego State College, *Announcement of Courses 1928–1929*, June 1928 (California State Printing Office, 1928), 8, 37, 48. Later while working for United, he took Boeing's courses in Air Law, Aeronautical Meteorology and Advanced meteorology.

40. Ritland Papers. Examples of these texts are Fred B. Seely and Newton Edward Ensign, *Analytical Mechanics for Engineers*, 3rd ed. (Wiley, 1941); and Charles Norton Monteith and Clifton Carroll Carter, *Simple Aerodynamics and the Airplane*, 4th ed. (Ronald Press, 1932).

41. "1212 Students at State," *The State College Aztec* 10, no. 5 (October 15, 1930): 1, SDSU Digital collections. According to the 1929 San Diego State College yearbook, he also played on the "Frosh" tennis team. And he pledged Omega Chi fraternity that year. See *Del Sudoeste*, 1929 San Diego State College yearbook, San Diego State University Archives. Ritland appears on pp. 97 and 108.

42. See *Del Sudoeste*, 1930 San Diego State College yearbook, San Diego State University Archives. Ritland appears on several pages beginning with p. 116 that talk about the basketball season, one that ended in a 2-win, 5-loss season for the team.

43. "1930 Basketball Outlook Good at San Diego State: Ritland to Captain Quintet; Four of Games to be Home Tilts," *The State College Aztec* 10, no. 5 (October 15, 1930): 3; Frank Guthrie, "Red Devil Quintet Travels North to Open Basketball Season with Tech Beavers," *The State College Aztec* 10:14 (January 7, 1931), 3. Ritland played forward.

44. Stan Wilson, "Bulldogs Get Crucial Game at San Diego," *San Bernadino Sun* 67, no. 181 (February 28, 1931): 18, California Digital Newspaper Collection; and "Redlands Win Cage Laurels," *San Bernadino Sun* 68, no. 1 (March 1, 1931): 20, California Digital Newspaper Collection.

45. "Chose Ritland A.S. Secretary on White Ballot," *The State College Aztec* 10:4 (October 8, 1930), 1.

46. Biography, Col Osmond J. Ritland, National Defense University Archives.

47. Lorine Flemons Wright, "Major General Blazes Path in Air Force History," *Rancho Santa Fe Review* (October 24, 1990), 8, provided by daughter Kathleen Ritland Montoya.

48. "The Air Corps" (for radio Speech), February 3, 1931, quoted in Rebecca Cameron Hancock, *Training to Fly: Military Flight Training, 1907–1945* (USGPO, 1999), 222.

49. O. J. Ritland to Adjutant General Washington, DC, Letter, October 3, 1930, Box 3, Ritland papers. This letter, incidentally, Ritland signed occasionally over the years, including every decade he served in the military, the last signature dated "5 APR 1990."

50. Hancock, *Training to Fly*, 225–26.

51. Ritland oral history, 6; and "Statement of Service," Ritland papers.

52. 1930 US Census.

53. Adjutant General of the Army, "Flying Cadets of the Air Corps: Aviation as a Career" (USGPO, 1928), 1–12, Ritland papers; and Alice Olenin and Thomas F. Corcoran, US Department of Labor, "Hours and Earnings in the United States, 1932-40" (USGPO, 1942), 2.

54. Ritland quoted in Doyle Kline, "Local Expert on Dropping A-Bomb Leaves Soon for Washington Study," *The Albuquerque Tribune* (June 12, 1953), 4.

55. Ritland oral history, 6–9.

56. Hancock, *Training to Fly*, 252–53.

57. H. H. Arnold and Ira C. Eaker, *Army Flyer* (Harper and Brothers Publishers, 1942), 43.

58. Ann Krueger Hussey et al., *A Heritage of Service: Seventy-Five Years of Military Aviation at Kelly Air Force Base, 1916-1991* (Kelly Air Force Base Office of History, 1992), 42–43, 48.

59. Hussey et al., *A Heritage of Service*, 41.

60. Ritland oral history, 18–19; and "Flying Cadets of the Air Corps," 2–3, Ritland Papers.

61. Brig Gen Noel F. Parish (USAF, Ret), oral history, interview by James C. Hasdorff, June 10–14, 1974, 34, K237.0512-744, AFHRA, cited in Hancock, *Training to Fly*, 257.

62. "Cadets Go To Kelly," *The Tee* 1, no. 11 (October 31, 1932): 1, 6, https://dmairfield.org/, accessed February 14, 2026. Also mentioned in this edition of the newsletter, at the same time, 95 members of the July 1932 class, which included then Flying Cadet Bernard Schriever, moved up from primary flight to basic flight training.

63. Ashcroft, *We Wanted Wings*, 26.

64. Hancock, *Training to Fly*, 258.

65. Ritland oral history, 18–19; and "Flying Cadets of the Air Corps," 2–3, Ritland Papers.

66. Hancock, *Training to Fly*, 259.

67. Quoted in Hussey, *A Heritage of Service*, 41. Lay wrote the military aviation classic *Twelve O'clock High!*.

68. Hussey, *A Heritage of Service*, 44.

69. Ritland oral history, 18–19.

70. Hussey, *A Heritage of Service*, 45.

71. Hussey, *A Heritage of Service*, 46.

72. Hussey, *A Heritage of Service*, 46–47.

73. *The Flying Cadet* 9, no. 8 (July 30, 1932), cited in Hancock, *Training to Fly*, 260–61 (598n51).

74. Hussey, *A Heritage of Service*, 48. A lucky few received regular commissions in the Army, but these were rare. Second lieutenant pay was set at $125 a month, but a certain amount was forfeited back to the government because of the Great Depression, a kind of income tax.

75. Hussey, *A Heritage of Service*, 50.

76. Edmund C. Wolf, "In Memoriam," *The Tee* 2, no. 3 (March 1, 1933): 4.

77. Ritland oral history, 1–3; "Boeing P-12E," National Museum of the United States Air Force (hereafter NMUSAF) (April 7, 2015), https://www.nationalmuseum.af.mil/; and "Boeing P-26A," NMUSAF (July 21, 2015), https://www.nationalmuseum.af.mil/. The unit, which had been formed in 1917 and saw service in World War I in France, was redesignated the 95th Attack Sqn in 1935 and today lives on as the 95th Reconnaissance Sqn. See Carl E. Bailey, "95 Reconnaissance Squadron (ACC)," Air Force Historical Research Agency (July 7, 2017), https://www.afhra.af.mil/.

78. Arnold, *Global Mission*, 133.

79. "Reserve Officers Reach March Field," *Riverside* (California) *Daily Press* (March 21, 1933), 3.

80. Arnold, *Global Mission*, 133–34.
81. Arnold, *Global Mission*, 134.
82. Cameron, *Training to Fly*, 262.
83. Bruce Harley and Claude Heitman, *The March Field Story: 50th Anniversary, 1918–1968* (Historical Division, Fifteenth Air Force, 1968), 31–40; and Arnold, *Global Mission*, 133–40.
84. "March Field Officers and Wives Entertain at Several Affairs," *Riverside* (California) *Daily Press* (January 27, 1934), 7.
85. Walter P. Parks, *The Famous Fliers' Wall of Mission Inn* (Rubidoux Publishing, 1986), 23.
86. Harley and Heitman, *The March Field Story*, 31–40; and Arnold, *Global Mission*, 133–40.
87. "Boeing P-12E," NMUSAF; and "Boeing P-26A," NMUSAF.
88. Col Mike Worden, *Rise of the Fighter Generals: The Problem of Air Force Leadership, 1945–1982* (Air University Press, 1998), 1–3.
89. Clair A. Peterson, interview by Donald F. Shaughnessy, March 15, 1959, Columbia University Oral History Collection, 21, by permission of Robert Arnold, email to the author and Columbia University, August 20, 2022, https://clio.columbia.edu/, provided as a PDF by file download, September 9, 2022.
90. Bernard C. Nalty, *Winged Shield, Winged Sword: A History of the United States Air Force*, vol. 1, *1907–1950* (Air Force History and Museums Program, 1997), 123–24.
91. "Report on Accident to Boeing P-12 F at March Field, Piloted by O. J. Ritland," October 4, 1933, AFHRA, 200.3912-1. Serial number for Ritland's aircraft was 32-99.
92. "Boeing P-26 A," NMUSAF.
93. Arnold and Eaker, *Army Flyer*, 63.
94. Ritland oral history, 8–10.
95. Montoya, interview . There is some question as to whether these buzzings, of which apparently there were several, happened when he lived in San Diego and worked at North Island or while he was stationed at March Field. It seems more likely Ritland, who called ahead to let Martha know he was coming, could have flown the 90 or so miles from March Field to Grossmont High School in a P-26, whose range was 570 miles and had a cruising speed of 160 mph. Such a trip would be a good cross-country training flight for a young aviator.

Chapter 2

Flying During the Great Depression

As his active duty service commitment neared its end and General Foulois's 1932 graduation comments reverberated, on February 28, 1934, Ritland left the military without a job and with two possibilities: to go back to school or to try to catch on with the airlines. Just two days later he was recalled to active duty for the next American aviation crisis.[1]

In 1927, even before the Great Depression hit every aspect of the American economy in late 1929, 90 percent of airline revenues came from government postal contracts, because the airlines were simply not carrying enough passengers to make a profit.[2] The mail was so profitable they would often bump a passenger off a flight and put bags of mail in their seat, because the post office paid by the pound to carry the mail. Bidding for the airmail contracts had become highly competitive and loaded with controversy, if not outright fraud. The Hoover administration's Postmaster General Harry Stewart New consistently favored those airlines with the strongest financial backing, provoking angry protests from the many smaller companies, usually to no avail. Eventually Congress got involved and found evidence of "a wholesale conspiracy to defraud the Government."[3] Following a lengthy controversy, on February 9, 1934, Franklin Roosevelt's Postmaster General James A. Farley announced he was canceling all the airmail contracts effective at midnight February 19. This action took the airline industry by surprise. It had been slowly working its way back to profitability as passenger revenues steadily increased, but in 1934 the airlines still needed the mail subsidy. One observer not long after thought, "It was indeed doubtful if any of the [air]lines could continue their extensive operations for any great length of time after the cancellation order."[4]

Harlee Branch, chairman of the Civil Aeronautics Board, asked Foulois if his pilots could take over flying the airmail. Foulois was one of the members of the Army's Aeronautics Board that had evaluated and then accepted the Wright Model A Military Flyer in 1909. Wilbur Wright had given Foulois his first flying lesson, but they did not complete the training before an order came through to take the whole air force—which was that one Wright military flyer—to Texas to seek out better flying weather. Foulois completed his flight training with the Wright brothers by correspondence. And he did all that on an aviation R&D budget in 1910 of $150, which Foulois supplemented with his own money.[5] Now in 1934 as chief of the Air Corps, he knew what it meant to take on daunting challenges in aviation.

Foulois thought a moment before answering Chairman Branch. The Air Corps was not set up to fly cargo in 1934 the way it was by 1945 or is today. Its pilots had never flown regular schedules or on instruments at night. He began to think that by using converted bombers and observation planes his pilots could get some training that was needed but curtailed because funds were always low for fuel, equipment, and spare parts in the postwar Air Corps. Foulois saw a chance to win friends in the White House and on the Hill.[6] He told Chairman Branch the Army could be ready in "about a week or ten days" to start flying the mail. Although he did not mean it literally, by the time Foulois had returned to his office at the War Department, FDR had already approved a plan to have the Army ready to fly the mail by February 19, 1934, 10 days later.[7] With that, according to one historian, "The Army took to its new job like a hawk to the air."[8]

The airlines understandably pushed back on the idea of the Army flying the mail. Eddie Rickenbacker was concerned about safety because of Air Corps pilots' limited training and their aircrafts' lack of cockpit instruments for flying in bad weather. He worried that "either they are going to pile up [aircraft] all the way across the continent or they are not going to fly the mail on schedule."[9] Charles Lindbergh, himself a former civilian airmail pilot, agreed: "The lives of men inexperienced in mail operations, and flying planes not equipped with radio or blind flying instruments necessary for the [airmail] service, may be risked." Lindbergh, who had laid out some of the early airmail routes in the 1920s, was a consultant for Pan American and protested to FDR that canceling the airmail contracts was going to hurt the airlines. He saw the airmail crisis as part of the failure of FDR's "socialistic" New Deal, declaring that he would not help the military do the work of "American business and commerce."[10] Rickenbacker, now an executive with Eastern Air Lines, worried about "what is going to happen to these young Army pilots." Will Rogers cracked that "it's like finding a crooked railroad president and then stopping all the trains."[11] After casualties did begin to occur later, Rickenbacker called the Army airmail program "legalized murder."[12]

The Army, according to historian Ken Werrell, "shifted resources to civilian airfields near the cities it would service, installed non-visual flying instruments in aircraft as needed and had its pilots fly over the routes in daylight."[13] Foulois decided to reduce the number of airmail routes from the airlines' 26 to just 12 that would prioritize banking transactions and link the federal reserve banks. That still meant 70 stops and over 13,000 miles of airways for the new airmail pilots to handle.[14] Wrote Werrell, "Most of the airmen saw the operation as a great opportunity, were excited and confident, although some were cautious. Flying the mails offered the service increased flying time, a break from the peacetime routine, and an opportunity to show the country its value."[15]

To Hap Arnold, the new mission was "equal [to] the sacrifice of a wartime combat operation" but without the time to prepare or the equipment to accomplish the mission. "Courage alone," he later wrote, "could not substitute for years of cross-country experience; for properly equipped planes; and for suitable blind flying instruments, such as the regular air-line mail pilots were using."[16] Recalled Arnold in his book *Global Mission*,

> We were given ten days in which to orient ourselves. That is, my boys had ten days in which to "familiarize" themselves with the topography and weather idiosyncrasies of the air-mail routes. My pilots were mostly Reserve officers, none of whom, owing to the War Department policy of turning over Reserve officers in a squadron at the rate of 25 or 30 per cent a year, had had two years' service [like Ritland]. Very few of the "regular" civilian air-mail routes had been flown over by these officers. They had none of the special air-line instruments; they must fly in whatever planes we had, including trainers. There was not—especially in the case of the open-cockpit

> fighter types that had to be flown—even enough space for the mail bags. All sorts of space had to be found to hold them.[17]

The Army began modifying its collection of bombers and pursuit planes, mainly open-cockpit biplanes, to carry the mail, a task they were wholly unsuited for. Soldiers stripped planes of armament, seats, and nonessential equipment. Rear cockpits of observation planes were converted into mail compartments. Baggage compartments of attack and pursuit planes were modified to squeeze on a few extra bags of mail. They sealed the bomb bays of their newest bombers for mail storage.[18]

Eaker's 34th Pursuit Squadron had eight or ten P-26s, open-cockpit, single-seat planes with almost no cargo space, no radios, and no instruments or lights for night flying. His pilots were not trained to fly in the dark, but they had to fly at night "because the post office wanted early morning delivery." The Army calculated they could fly about 50 pounds of mail in a P-26, but on the first night, the requirement for the Los Angeles to Salt Lake run totaled 1,400 pounds, the equivalent of 28 missions. Eaker called Arnold, who offered an old B-2 bomber, which none of Eaker's pilots had ever flown. Eaker ended up flying as copilot with several young pilots until he felt they could fly mail routes on their own.[19]

At the time, the skills of commercial airline pilots were far above the typical Army aviator. Airline pilots were flying at night by the mid-1930s, with two-way radios to get weather information ahead of landing and some instrument flying experience to help in bad weather. In fact, by installing barographs, a kind of primitive recording tool, in airplanes, United Air Lines already knew its pilots were relying on electronic aids to fly their planes 80 percent of the time. The Army did not have the latest aviation instrument technology in its planes. Few even had landing, navigation, or cockpit lights. The new radio direction-finding processes had been worked out by airline pilots, not Army aviators, and the Army did not have any radio equipment in its planes to practice with, anyway. In hasty training before the formal operation began, three pilots died. During the week that actual flights began in February, vicious winter storms swept across the country and added to the casualties: Two more pilots died, six were injured, and eight planes were destroyed.[20]

As unprepared as the Army was, Foulois ignored everyone's doubts. On February 15, just a week after saying yes to the mission, Foulois officially assigned 269 pilots, 340 enlisted men, and 146 planes to fly the mail. Some pilots, like future general Pete Quesada, had just 24 hours to get to the Eastern-Zone hub at Newark, New Jersey.[21] Ritland joined, too, returning to active duty on March 2, 1934, two days after his release from the service. He received a call late at night to report to a hangar at March Field at 5 a.m. the next day for a trip, not knowing where he was going or how long he would be gone. The phone call did not seem unusual to him and was common in those days: "You just packed up and reported there," he noted. That morning, he climbed into a Curtiss B-2 bomber's "meat can," the "circular cell behind the engine," and headed out, stopping in Salt Lake City and finally arriving in Denver about 10:30 that night, scheduled to fly the next day. The next morning, he and three other pilots got their assignment: They were to ferry four Douglas O-38 observation biplanes to Salt Lake City. Ritland had never flown the obsolete two-person, closed cockpit O-38E before but that did not seem to matter. He recalled, "They just showed us where the stick was and the rudder and the throttle and told you how much gas you needed." Then they flew, in good weather fortunately, from Denver to Cheyenne, Wyoming, and then to Salt Lake City without a mishap, turning the planes over to the headquarters of the Western Airmail Region, which was led by their March Field boss Arnold. One of the pilots also in this region was Lt Bernard Schriever, who was assigned to fly the Salt Lake City to Boise and Salt Lake City to Cheyenne routes.[22]

When Ritland got to a stop where he had to spend the night or remain because of weather, he was on his own to rent a room at a local hotel or in a private home, without the benefit of per diem pay to reimburse those expenses. Some pilots wrote personal checks to pay for their expenses or borrowed money from a local bank to make ends meet. The arrangement was even worse for enlisted men stationed at the many very remote points along the air mail routes and who often earned less than $25 a month.[23]

In Arnold's Western Zone, most of the pilots reached their starting stations by Thursday, February 15. When word came from Coalville, Utah, that they had 2,000 feet visibility, air reserve pilot

Lt George D. Grenier went to make a practice run to Cheyenne. Grenier was unfamiliar with the route and was not a trained instrument pilot. In the modified Curtiss A-12 ground attack fighter rode fellow reserve officer Lt Edward D. White, coming along to familiarize himself with the route. Coalville was the first checkpoint, no more than 30 miles from Salt Lake City, but it sat in a basin surrounded by the high, rugged Wasatch Mountains. Grenier and White never reached the Rocky Mountains and never got beyond the canyon leading into Coalville as the weather closed down behind them. Spotting a wide canyon that appeared to open to eastward, Grenier flew into the canyon, and a swirling snowstorm engulfed them. The canyon had a dead end, its top close to 9,000 feet. At 8,500 feet, with the A-12 icing up, he could not climb any higher. "Desperately Grenier circled," according to historian Dewitt Copp, "blinded by snow, trying vainly to find a way out of the trap. For him there was no way out, and the A-12 plowed into a mountainside, exploding in flame." Arnold understood that no pilot at the time "had sufficient experience to realize that the weather changed with startling rapidity in the Wasatch Mountains or that the commonly accepted theory that '1500 feet was sufficient to get through' meant little or nothing in the Rocky Mountains."

As Army aviation deaths mounted, so did the pressure on the president. When FDR asked Foulois in the Oval Office, "General, when are these air-mail killings going to stop?," Foulois's response was, "Only when the airplanes stop flying, Mr. President," after which Foulois recalled FDR handed out "a tongue-lashing which I put down in my book as the worst I ever received."[24] But the Army kept flying the mail. Wrote Copp in *A Few Great Captains*,

> The single most imperative word that struck the Air Corps during the first week and then the first month of its assignment to carry the mail was weather—every imaginable kind of weather, not just in one location of the country but in most locations. It was as though a consortium of goblins had concocted a stinking brew of foul elements and spread it over the land from sea to shining sea. Their demonic laughter rode in the gale winds that buffeted and tore open cockpits, congealing their occupants, glazing over instrument panels with ice, snapping off the delicate lifeline of radio communication.[25]

For pilots with little to no bad weather flying experience like Ritland, it was a very dangerous time.

In writing about the airmail fiasco, historian Werrell pointed out that military

> flying in the mid-1930s was considerably different than what we experience and expect today. . . . There was no ground control, radar, inertial navigation devices, or operational non-visual landing systems. Most flying was conducted in daylight and fair weather conditions. Instrument flying was in its infancy with only a few non-visual instruments in service. Low visibility takeoffs and landings had been demonstrated, but their standardized use was years away. At the same time radio navigation and communications equipment were just appearing, but were both limited in range and reliability. Thus, flying at night and in non-visual conditions was not the norm and was more difficult and more dangerous than daytime, visual flying. Only the major commercial airlines had the necessary equipment and personnel trained in its use. Also, aircraft and weather prediction in the 1930s were much less reliable than today.[26]

Early in the airmail program, Ritland was not qualified to fly the mail because like many new Army pilots he needed experience with instrument flying. To that point he had been working on his overland navigation skills using the new directional radio and range systems, which aided flying at night and in bad weather. Maps and compasses remained important, however, and the US government was in the midst of mapping the entire nation, which would not be completed until 1937 when the Commerce Department published a series of maps available to all military and civilian pilots.[27] Therefore, his next stop was heading home to Rockwell Field for instrument training school. Flying OA-4s and BT-2s there, they learned the basics but did not get a lot of practical experience in training aircraft that were not meant for heavy weather, which San Diego did not have a lot of, anyway. There, after classroom training, he did 26 hours of instrument flying in a two-person airplane. Ritland flew under a hood over both land and water using a second "safety pilot" in case of emergency. He also did four hours of night flying over lighted airways using radio beacons and acted as a "safety pilot" for another student for 12 hours in the air. At the end of the course, Ritland had "to pass the same examination given to air mail and passenger transport pilots," according to a local newspaper article.[28] With instrument training completed, the Army sent him from San Diego to Washington state to fly P-12s again, this time from Seattle to Medford, Oregon, with about 40 pounds of mail behind the seat on each flight, making several flights each day and often at night, in bad weather, and even flying at altitudes so low he had to make his way around trees. "It was pretty wild, I'll have to tell you," Ritland recalled.[29]

As rudimentary as flight technology was, there were radio aids to navigation or beacons, which pilots could use to generally trace their paths, flying from one transmitter to the next, a method generally in use today. Sometimes you could call a ground station and ask if the operator could step outside to listen for the plane passing overheard. He might come back on the air after a few minutes and report, "Hey, I just heard you going over to the west, you're right on course." But often there was too much static to rely on the radio nav aids and "on many flights," Ritland recalled, "you'd fly half the flight by just by-guess-and-by-God, with too much static to talk."[30]

But even with improved training and technology being added to cockpits like two-way radios and lighting, casualties continued to mount. Western Zone commander Arnold complained of the "immense handicaps" Army pilots faced. By the end of February 1934, there had been 20 major airmail accidents and six fatalities. In the first 10 days of March, more major airmail accidents included four fatalities. Four airmen died in three crashes on March 9 alone.[31] One airline pilot called to active duty two days before crashed in Cheyenne on a training flight. Recalled Arnold, "here was an experienced pilot, one who had been flying commercial planes out of Cheyenne, and 'he goes up in an Army plane, and bingo, he goes in a spin and kills himself.' "[32] FDR had no choice but to order all airmail flying halted. On March 12, Foulois ordered all Army planes grounded until a new schedule could be worked out. When they got back into the air six days later, this time flying only in daylight, the public outcry was more than the administration expected. The public now complained about both the casualty rate and that two-day airmail service was too slow.[33]

The days remained long and the weeks hard. When he asked, Foulois found out 18 hours a day, seven days a week was a normal schedule. When one new pilot inquired about duty hours from an older officer, the reply the new arrival got was, "Well, Junior, I'm going on my thirtieth hour now without sleep if that will help answer your question."[34] Over the next two months, through May 13, the date of the last accident in the airmail operation, the Air Corps had 29 more major accidents and three more pilots died. In Werrell's estimation, "The Air Corps' safety record carrying the mail was abysmal. The air mail operation accounted for 12 percent of the Air Corps' flying hours in 1934, yet it registered 31 percent of the fatal accidents."[35]

Reasons for the failures in the military airmail program are obvious as we look back: Army warplanes were not designed to fly the mail. Support equipment was inadequate. Training was poor: Pilots got a mere 10 hours of instrument flight training in 1930, a figure that doubled in May 1934 during the airmail crisis for pilots like Ritland. The Army had established two six-week instrument flight schools, one on each coast in the fall of 1933, to produce instrument flight instructors, but only their second class of students had begun when the airmail crisis began. Communications systems were poor. Aviation infrastructure had problems, too, especially the airports that were really just open fields in a period before hard-surfaced runways. And of course, most pilots had limited flying experience.[36]

In Ritland's opinion as he looked back on the experience, weather and training were the biggest problems in the airmail program. Even instrument-trained pilots did not do well because they were not training in the actual weather conditions they faced, and the training did not do a good job of teaching them about the instruments themselves. The only cure for those problems was experience with instruments and in bad weather and that takes time. Even still, the aircraft used in the airmail program were not very good in icy weather because they could not go high enough to escape the conditions.[37] The accident rate was discouragingly high, and the president eventually stopped the Army's participation in the airmail program.

By the middle of summer 1934, the airlines were starting to fail, and two major companies were planning to suspend operations. United Air Lines lost $854,000 in the first quarter of 1934 while American lost $850,000 in the first four months of the year.[38] The Post Office and Congress eventually worked out a solution to get the airlines flying the mail again. By the time it was all over, the Army had flown over 13,000 hours and "1,590,155 miles with 777,389 pounds of mail at a cost of $2,767,355.22, 57 accidents and 12 deaths."[39] Their sacrifice "proved that flying the air mail was a job for trained specialists, not for Army pilots on a part-time basis. It also showed Congress that the Army's inventory of airplanes was woefully inadequate and that, as a group, the Army pilots needed better training."[40] Although Congress did not appropriate more money for the Air Corps in 1935, FDR did succeed in getting more money in subsequent years. The Army began courses to train pilots on instrument-landing techniques, including 35 hours of instruction in instrument flying. The Army also bought trucks and equipment for creating portable ground stations to create temporary airfields. And all new airplanes came with two-way radios.[41]

In Foulois's estimation, the Army learned not from its successes in the operation but from the failures, which focused public attention on the poor training and equipment in the Air Corps, which Foulois blamed on the lack of interest in military aviation in Congress or the executive branch. "The sudden need to provide a national service and the subsequent tragedies," he wrote, "proved how weak our air power was as nothing else could have [shown our weaknesses] short of war. It was from this tragic experience that the first giant step was made toward the creation of an independent Air Force."[42] In historian Kathy Wilson's estimation, the airmail crisis revolutionized Army aviation through better training with the introduction of the Link training system; new technology like the Alfred Hegenberger–designed blind instrument landing system, soon a standard in the military and in civilian aviation; realization of the need for new reliable radio communications; the creation of the Army Airways Communication System, which included "control towers, navigation beacons and radio stations at 33 sites" across the United States; and more instrument and night flying requirements for Army pilots.[43]

With the air mail crisis over, Ritland was going to be discharged from the Army again. He had a new problem to solve: Should he go back to school to finish his degree or search for an airline job? Either way, he did not have any money coming in to pay his expenses.

The Great Depression hit the Army hard just as Osmond Ritland was getting his wings and his military flying experience. The number of Army airplanes declined in the early 1930s, because Congress failed to provide significant funds for the new all-metal planes whose improved performance and equipment were the next evolution in aviation technology. The Army had to suspend procurement of replacement planes for a year and simultaneously dispose of older planes. By 1936, the Army had 500 fewer planes than it did five years before. Officer strength also declined from 1,574 in mid-1932 to 1,463 in 1935. The Air Corps, however, asked for more money, requesting $40 million for operations, maintenance, and procurement of 428 new airplanes. It received just over $25 million to spend on new bombers and fighters.[44]

Three weeks after FDR's first inauguration in 1933, the Bureau of the Budget gave the War Department a figure of $196 million for its programs, a cut of $74 million and down over 25 percent from the previous year. The Air Corps spent just $1.4 million in 1934 on 26 new Martin B-10B bombers, the Army's first all-metal, single-wing bomber, that Hap Arnold called "the air power wonder of its day."[45]

Cutbacks in government expenditures occurred in other ways, too. Since 1932, Congress had been allowing the government to furlough federal employees without pay for one month, including the military. Congress abolished the authority in early 1933 but replaced it with allowing FDR to cut salaries, which he did, by 15 percent, which cost Air Corps officers more than they had given up under the furlough system. Enlisted men saw their pay drop, too, as a private's pay went from $21 a month to a mere $17.85.[46]

For Ritland, a pursuit pilot who flew alone in his single-person airplane, there were fewer than 170 annual flight hours available, a mere three hours of flight time a week. There were no bombs to practice bombing skills. The Air Corps cancelled annual maneuvers and brought in fewer flying cadets; those who did get their wings had to stay a cadet until they had been with a tactical unit for a year after graduation.[47] For those officers at March Field, a new non-flying additional duty arrived when Arnold became the commander of the Western Civilian Conservation Corps district, eventually consisting of 7,000 men at 25 dispersed camps. According to one official history, "At one point in mid-1933, 29 of the 88 officers assigned to March Field were on duty at camps; 22 others served full-or part-time on Arnold's staff at CCC district headquarters. The 1st Bombardment Wing ceased to exist. Group training stopped. The 7th Bombardment Group consolidated all its flying in the 11th Squadron; the 17th Pursuit Group did the same in its 95th Squadron," which was Ritland's unit. Arnold himself went out preaching the gospel of airpower to the Los Angeles Chamber of Commerce, junior college classes, high school students, veterans' organizations, and practically anyone who would listen.[48]

Eventually, "Air Corps expenditures rose from $20.3 million in 1935 to $32 million in Fiscal Year 1936, $41.1 million in 1937, $50.9 million in 1938, and then jumped to $83.1 million in 1939. With more money the Air Corps procured additional pilots and mechanics and bought new and better airplanes and accessories; GHQ Air Force shored up its units, secured extra gasoline for training and operations, and expended more ammunition in bombing and gunnery practice."[49] But a spending spree by comparison was still several years into a future that remained an undiscovered country.

So, in the 1930s, Ritland once again had to overcome obstacles, solve problems, and demonstrate both technical and leadership skills as he transitioned from military flying to the rapidly changing world of commercial aviation.

For Ritland, the Great Depression–era Army was where flying hours were few and promotions even fewer. With the airmail fiasco in the rear-view mirror, his active service came to an actual end on May 21, 1934. Ritland applied for a regular commission in the US Army Air Corps, something that would have guaranteed him a career in the military, important in the lean years of the Great Depression. Despite an evaluation in January 1935 from the 95th Pursuit Squadron commander characterizing Ritland's "service, his ability and efficiency during his period of active duty [as] excellent," he did not receive the commission and sought opportunities outside the Army.[50] Leaving the service was not at all unusual for military pilots after they completed their obligations because pay was low, promotions were slow, and there were not a lot of hours to be had in the skies. Bernard Schriever also left the service to go fly for Northwest Air Lines around the same time, as did many other Army pilots. Ritland had been extended on active duty because of the airmail requirement, so his tenure was an above-average length of time after his original discharge date. The Army had a Depression-era policy of releasing reserve officers from active duty after about 18 months, though even that was not a hard-and-fast rule. But Ritland did not give up his dream "from the very beginning, when I was a youngster fourteen years old" in 1923 of being a military pilot, and he continued to serve brief periods of duty.[51] Nevertheless, over 50 officers were scheduled to leave the service by June 30, 1934.[52] Eventually, "three captains, five first lieutenants and 21 second lieutenants at March Field completed their term of service . . . and left the Riverside Army post for their homes," according to the local *Riverside Daily Press*.[53]

Ritland's seniors, Ira Eaker and Tooey Spaatz, recommended the young pilot for a commercial airline job to Harold "Slim" Lewis, who had been the chief pilot at United Air Lines's western division since 1929. Ritland started there the very next month in February 1935 and flew with United for most of the next four years. He lived in several cities from Seattle to Pendleton and flew routes in the western United States, often over the Rocky Mountains.[54] "It was an exciting time to be at the airline because everything was so new," Ritland said. "There weren't many pilots; so I knew all of them. There were very few regulations. We barely had a control tower. The planes I flew only had 10 passengers, and the stewardesses had to be registered nurses."[55]

As airmail contracts returned, government regulations smoothed out, and new airplanes entered company inventories, commercial aviation took off. United expanded its schedule in July 1935 to 50,000 air miles daily, including the addition of a sixth daily round trip between Chicago and Salt Lake, an eleventh daily round trip between Chicago and New York, and a third daily flight linking Los Angeles, Chicago, and New York. Flights left LA at 6 p.m., flying overnight to Chicago so passengers could reach Cleveland by lunch and get to East Coast cities in time for afternoon business meetings. It was a good living for Ritland, who moved from Spokane to

Portland that month to fly as a copilot on trips between Portland's downtown grass Swan Island airfield and Salt Lake City.[56] And he had married his high school sweetheart, Martha Virginia Alsup, on March 20, 1936, in a small, family affair in San Diego.[57]

With the move to Oregon, Ritland had the opportunity to learn even more about aviation by flying with different pilots and learning how they worked. Some airline pilots knew the terrain so well that even in bad weather, "they'd fly by the seat of their pants," he recalled. "I've had many weird flights on that." But other pilots flew on instruments in bad weather, "and they would just bore up through it and away they'd go." He remembered a trip from Seattle to Portland with an older pilot when, in some weather, they "flew around for fifteen minutes looking for a hole" in the clouds to land while a younger pilot, who had departed Seattle "about half an hour after we did . . . was on the ground by the time we got in—showing technology, experience, how it helps."[58]

Equipment in the cockpit was simple. Initially "they just had the needle, the ball, airspeed, and the compass." Some aircraft had attitude indicators, also called gyroscopes or gyros, but they were rarely used. Ritland's first instrument flight check, in a United Air Lines Boeing 40-B single-engine, four-passenger biplane, was with Ed Yurivich, who only let Ritland use "a watch, a clock, a needle and ball, an airspeed [indicator], and an altimeter. And you had to fly around and put that thing down on an instrument approach in around a 300-foot ceiling."[59] Ritland passed and became an airline pilot.

Ritland's first passenger-carrying flights were in the Boeing 80-A, a trimotor biplane designed to compete with Ford's "Tin Goose" and Fokker's trimotor, both of which had most of the commercial passenger market. After years of producing military aircraft, the model 80 was Boeing's first attempt at getting into the passenger market. The first four model 80 trimotors, described by one aviation historian as "the last word in luxurious air transportation, were delivered to Boeing Air Transport in August 1928. The interior of the 12-passenger transport resembled a luxurious railway coach, with such features as hot and cold running water, forced-air ventilation, heat, and individual reading lamps. The walls and ceiling were three-ply plywood covered with a highly polished dark mahogany face, coordinated with brown leather upholstered chairs."[60] The "rocking chair comfortable" Boeing 80-A "was also one of the few manufactured aircraft that had a perfect passenger safety record. None of the twelve manufactured ever had a fatal accident, although several were written off after landing accidents."[61] Although the 80-A was a successful step in aircraft design, Boeing built only a few of them because commercial aviation technology was rapidly changing.

What followed was the Boeing 247, the first modern airliner. It was all metal, with low wings and one engine on each side.[62] The airliner even looked fast. It introduced a list of firsts that had all the other airlines "awestruck."[63] The 247 was the same size as the big Ford 5-AT trimotor, but it was faster.[64] The fuselage construction was welded steel and aluminum tubing covered with fabric inside. The 247 had two 410-horsepower Pratt & Whitney Wasps and later two 525-horsepower Hornet engines.[65] "At 5,000 feet with 75 percent power it cruised at 155 miles per hour, making it the fastest multiengine commercial transport plane in the world."[66] The plane "weighed 6 tons, yet needed only 800 feet for takeoff and landed within 500 feet at a speed of only 58 miles per hour. It could reach 10,000 feet in less than 10 minutes."[67] Fuel consumption, an expensive consideration in any airline operation, was also less than its predecessors, consuming just 360 gallons of gas per 1,000 miles, compared to a Ford's 675 gallons.[68]

Fig. 3. Boeing 247D as displayed the National Air and Space Museum

The 247's cockpit had dual controls, and the main instrument panel had some 35 gauges and instruments—a vast improvement over the Ford trimotor.[69] The pilot and copilot sat up front in an enclosed cabin separate from the passengers. United eagerly acquired the first sixty 247s.[70] The 247 was also the first commercial multiengine aircraft to have retractable landing gear, which increased speed by reducing drag. The gear was electronically or manually operated, but in an emergency the plane could land with the gear fully retracted since half the wheels extended beyond the wheel well, a feature the designers said could protect passengers in an emergency.[71] Trim tabs, borrowed from the Boeing YB-9 bomber and which made the airplane easier to maneuver, also made their first appearance on an airliner.[72]

Quickly the 247 boosted United's ticket revenue. "In Chicago alone, on a single day 160 passengers booked tickets at United Airlines, setting a new travel record for that city."[73] United advertised the plane as the "Three-Mile-A-Minute Airliner."[74] It had been just 30 years since the Wright brothers' 12-horsepower engine had carried Orville 120 feet in 12 seconds.[75]

The new Boeing airplane was more than a technological revolution. It introduced passenger innovations, too, with vast improvements for their comfort. The cabin was six feet high, richly appointed, and very comfortable by the airline standards of 1933. Passengers could move freely in the roomy aisle between the two rows of seats, but the low-wing, cantilever design meant the main wing spar ran through the cabin, requiring passengers to watch their step.[76] "There was a major improvement in the cabin environment. Passengers no longer suffered from the chilling temperatures they had endured in the Ford. The insulation served as a blanket that kept the passengers warm, and more importantly, served as soundproofing. Passengers could talk across the aisle in a normal conversational tone—a welcome relief for those used to the ear-splitting noise of the Fords and Fokkers." The "carpeted floors, reclining seats, steam heat, and a cabin insulated from weather and noise had led Boeing to say, 'This plane is the airliner that will put us in the Pullman business.' "[77]

With these changes taking place in aviation technology, no longer were pilots the goggle and scarf types of the 1920s who taught Ritland to fly in Texas. During this transition from high-wing trimotors to low-wing passenger planes, the airline pilot also changed from a daredevil flier to a technician. A pilot's understanding of electronic communication and navigation became as important as his ability to fly a plane. One United Airlines historian wrote of the new pilots (at this time all commercial pilots were men), "Now he also had a lot more responsibility. Instead of two to four foolhardy adventurers sandwiched in the cabin in front of him, he had up to a dozen passengers behind him."[78]

Fortunately for pilots like Ritland, scheduled commercial aviation was one of the few industries during the Great Depression to increase business volume. In 1926, 5,782 people flew commercially. More than 500,000 passengers flew each year from 1931 to 1936, and over a million people flew in 1936 alone. Passengers dressed up to fly, and they were for the large part businesspeople, not casual flyers, at a time when the average fare was 12 cents per mile, twice what it cost for a railroad seat. Despite the Depression, as efficiencies grew in commercial aviation's routes, technologies, and aircraft, fares per mile dipped below six cents.[79]

Typical of many airports in the late 1930s that Ritland flew into, Portland's 256-acre Swan Island Airport was in the Willamette River, literally on an island built up from landfill, but 10 minutes from Portland's business and financial center and not far from the Columbia Gorge or the Cascade Mountains. When the airport opened in 1927, *The New York Times* reported that there were "no natural or artificial obstructions to interfere with the approach to Swan Island Field from any direction and conditions [were] said to be ideal for aviation." Army Air Service boss Maj Gen Mason Patrick said during a 1928 visit that the field "will be one of the finest flying fields in the United States." He expected that the reserve flying unit at Vancouver Barracks on the Washington-Oregon border would be moved to Portland and that there would be a flight training program established.[80]

But US airports in the 1930s had lots of issues. First, airports were too small, often barely providing enough room for airstrips, let alone hangars and terminals. Worse, only the largest cities had hard-surfaced runways for landing the largest of the passenger fleets, and while "only half the airports studied had prepared runways, most still relied on grass surfaces." Drainage systems were inadequate or nonexistent. Few airports had adequate lighting or suitable gasoline refueling services or weather or blind landing or even air traffic control systems. "Even most of the largest airports still relied on handheld fire extinguishers."[81] According to aviation historian N. Houston Johnson, "The rapid development of commercial aviation and the increasing importance of passenger operations mandated that airports rapidly improve their facilities or risk missing out on airline service."[82]

By the time Ritland began flying for United out of Portland, Swan Island was almost too small for airplanes about to hit the commercial market, like the Douglas DC-3, which was twice the size both in gross weight and in the number of passengers as the Boeing 247. In one instance in June 1937, according to a local newspaper, "Rain squalls with wind of varying intensity struck . . . in widely separated points of Oregon. In Portland a rough south wind cutting across the Swan Island airport made it impossible for the huge United Air Lines Mainlander [probably a DC-3] from Seattle to land. The plane continued to Medford [Oregon, 250 miles south] and sent its passengers back to Portland in smaller ten-passenger craft [like a 247]."[83]

Improvements were necessary because cities and towns had built airfields in the 1920s without anticipating the major technological changes that were to come in the 1930s. For example, Northern Virginia's Hoover Airport opened in 1926 and very quickly Washington Airport opened the next year, literally across the highway. The two airports merged in 1930, creating an airport that was too small (just 143 acres) and subject to Potomac River fog too often. On top of that, Military Road split the airport's longest runway, requiring special traffic lights to stop cars so planes could land or take off, a situation that lasted well into the late 1930s.[84] Portland was able to secure millions in grant dollars from the Depression-era Works Progress Administration (WPA) that would eventually put thousands of people back to work building a new airfield.[85] This process was similar to Department of Commerce and WPA airport projects around the nation at the time, providing valuable jobs during the Great Depression. Between 1933 and 1939, the WPA provided funds to build 480 airports and improve 470 others. According to Johnson, "Public works projects modernized America's airports and created the literal foundation for the postwar boom in commercial aviation. Through airport expansion—the construction of paved runways, new terminals, new and larger hangars, and paved ramps and the installation of perimeter lighting, runway lighting, and spotlights—and the construction of entirely new airports, these agencies put thousands of Americans to work while fashioning the physical foundations that made possible widespread commercial passenger service in large, modern airliners."[86]

In the second term of the Roosevelt administration, the government paid for upgrades to the air traffic control system, deploying radio ranging broadcast stations and expanding air traffic control centers, with the first one introduced around the Newark airport in 1935, reporting on the positions of other aircraft in the vicinity. Chicago and Cleveland opened their own air traffic centers in 1936, and others followed.[87] By the late 1930s, air travel seemed to have recovered from the Great Depression, going from 95 million "revenue passenger miles" in 1932 to 270 million in 1932 to 677 million in 1939. Transcontinental flights could be made, with stops, in 16 hours, for $150 (over $3,000 in 2026). While equipment, operations, and procedures were growing more standardized, "Pilots necessarily [became] more dependent on an army of meteorologists and ground personnel, plus reams of company and federal flight regulations."[88]

After moving Ritland from Portland to Seattle, United assigned him in 1938 to its training hub in Oakland to take advantage of his flying skills, instrument training, and weather experience. There Ritland ran the Link instrument training system for new pilots and was promoted to the rank of captain, making $290 a month.[89]

The Link trainer was an early version of a flight simulator used to train pilots on instruments so they could fly in bad weather. Inventor Ed Link used his experiences in his family's pipe organ business to design a trainer that moved and simulated flight. Historian Richard Bauman describes it as "a stubby, wooden fuselage with a cockpit, mounted on an organ bellows . . . operated by an electrically driven vacuum pump, which cause the fuselage to pitch and roll as the pilot 'flew' the trainer."[90] Inside the "cockpit" were "instruments, rudder pedals and a control stick, all of which responded realistically enough to give a would-be pilot the sensation of flight."[91] It sat on a fixed base and had stubby little wings and a tail. "Ed proved the efficiency and effectiveness of his technique by teaching his brother George to fly. After six hours of instruction and less than an hour of actual in-flight instruction, George was flying an airplane."[92] Link then took his simulator to carnivals, including at "the boardwalk at Atlantic City, where for 50 cents anyone could treat himself to an imaginary flight without the risk of getting off the ground. One day another pilot tried the on-the-ground airplane ride." The pilot thought it was "too good for a stunt" and suggested it be used as a real pilot trainer.[93]

Although Link invented his simulator in 1928, the Army was not interested in it until the airmail tragedies showed that its pilots had a lot of trouble flying in conditions other than VFR, or "visual flight rules."[94] By landing at the Newark airport in terrible weather after flying 200 miles from western New York in February 1934, when the Army needed pilots who could fly in bad weather, Link proved the value of his training aid and sold his simulator to the military. The Army got some emergency money from Congress to buy six $3,400 flight simulators. One went to San Antonio and another to March Field, which is almost certainly where Ritland had experiences with it as the Air Corps bought one or more Link trainers for each of the operational flying bases.[95] By 1936, the Army was offering 15-hour courses that required time in the Link trainer. Pilots could fly "the Link on a long cross-country trip confronting all kinds of conditions, from bumpy air and ice to split beams and false cones of silence." A new requirement soon arose that each pilot had to prove "his proficiency in instrument flying once a year by taking a test in either an aircraft or a Link trainer."[96]

According to United Air Lines historian Frank Taylor, "The Link Trainer soon separated the seat-of-the-pants fliers from the scientific technicians who were needed as captains and co-pilots in the electronic era of the Mainliners that were soon to emerge from the airplane factories."[97] By the time Ritland was at United, all 300 pilots were receiving "intensive training in instrument flying and approaches to airports by means of the 'fleet' of Link trainers," according to United's internal newsletter. Familiar to Ritland, United's Link trainer was "a small hooded airplane with conventional controls, flight instruments and radio communications facilities." Much like today's modern simulators, the United instructor sat at a special control table and regulated the radio range signals, marker beacons and two-way communication and could simulate wind conditions and other operating problems. The instructor could adjust the conditions and radio beacons to any airport, requiring pilots to react to their given scenario.[98] The Link trainer system recorded everything. But it was also because of the Link trainers and the systems established that accidents went down even as miles flown went up.

Yet even while he was flying for United and as a first lieutenant in the Army Reserve, Ritland maintained a desire to serve in the Army as a full-time military pilot. A regular commission was a big deal in the 1930s; it was a near-guarantee of a full career and, after a conflict, a chance to remain in the military. Officers with reserve commissions, like Ritland, were not expected to make the military a career but to return to civilian life and remain "in reserve" for a national emergency and then return to civilian life after the war. He applied for a regular commission in 1935, a process that included an exam (which included questions in English rhetoric, math, chemistry, calculus, and surveying, among other topics), interview, and records review, but was not accepted. Ritland applied for a regular commission again in 1938 and finished 337th of 463 candidates.[99]

But Ritland kept up with his military flying nonetheless. Flying pursuit planes was different from flying commercial airliners, after all. The Army set aside aircraft for reserve officers to fly at least one or two Saturday or Sunday afternoons every month. They received no pay except "the real pleasure of flying first-class equipment," according to *Western Flying* magazine. To keep his appointment as a reserve officer and be eligible for promotions, Ritland needed 300 hours of flying, but he also had to meet certain criteria beyond just airline flying, including many hours of study.[100]

The world was changing in the summer of 1939 and so was the Air Corps. The Roosevelt administration saw a storm brewing, even if the nation was reluctant to get involved. Despite British Prime Minister Neville Chamberlain's September 1938 declaration of "peace in our time," Nazi troops occupied most of Czechoslovakia and defied Western Europe's leaders. In August 1939, Hitler and Stalin signed a non-aggression pact. At the time, "The Air

Corps then owned 2,100 serviceable planes, 220 below the number authorized by Congress. President Roosevelt believed the Air Corps needed 20,000 but did not think Congress would approve so many. He called for production of 10,000 aircraft for the Army over 2 years." FDR soon asked for $300 million for 3,000 new aircraft and got authorization and funding from Congress for 5,500 new planes and an increase in personnel to 3,203 officers and 45,000 enlisted. The Air Corps cut the number of observation squadrons and upped the number of combat groups from 14 to 24, including "5 heavy bombardment, 6 medium bombardment, 2 light bombardment, 2 pursuit fighter, 7 pursuit interceptor, and 2 composite. Each heavy and medium bombardment group included a long- or medium-range reconnaissance squadron with the same kind of planes as the bombardment squadrons. Thirteen groups went to GHQ Air Force, 11 to overseas departments." Although the Air Corps had 39 B-17Bs on contract, it had just 13 B-17s in the inventory, a total of just 52 "heavy" bombers. The Air Corps went on a spending spree when the 1939 appropriations added $50 million to its budget. The service contracted for 155 Douglas B-18s, 524 Curtiss P-40s, 13 Lockheed YP-38s, 12 Bell YP-39s, 13 Republic YP-43s, 14 Beech F-2s, 7 Consolidated B-24s, and 186 Douglas A-20s.[101] In June 1939, Army Chief of Staff Gen George Marshall approved an Air Corps of 54 combat groups and 4,000 combat airplanes by April 1942. In 1941, this goal was increased to 84 combat groups, 7,800 combat planes, and 400,000 personnel, also by mid-1942. By March 1944, at its peak, the air service was 2.4 million men and 80,000 combat aircraft, having already accepted over 230,000 airplanes into service of all types.[102]

Having failed to earn a regular commission each year since 1936, determined to try to re-enter the Army as a regular officer, and about to be promoted to captain in the Army Reserve, Ritland took the test again in 1939. The Army simultaneously began an expansion that included bringing more reserve officers back on active duty and giving many of them regular commissions. In June 1939, the Army held another board "to secure qualified flyers for appointment in the Regular Army" and chose 310 officers for appointment as second lieutenants with regular commissions.[103]

On August 8, 1939, a telegram arrived at the Ritland's home in Oakland from the commander of the Presidio in San Francisco: "YOU HAVE BEEN SELECTED REPEAT HAVE BEEN SELECTED FOR APPOINTMENT AS SECOND LT AIR CORPS REGULAR ARMY." On the 1939 board, Ritland ranked 12 of 185 people applying for a regular commission. The cable instructed him to accept the appointment "AT ONCE BY RADIO" and he would then receive instructions on what to do next. He accepted the Army's offer of a return to active military flying, but while he waited for the Army paperwork, he discussed the offer with Martha and his mentors and kept flying for United.[104] The Army allowing its former pilots to return to military service stressed the airlines' supply of pilots, too.[105]

Ritland's friends wanted him back in the military. In a letter dated August 12, 1939, from a fellow March Field pilot who had stayed in the Army and was still a first lieutenant some five years after commissioning, Ritland received some advice and encouragement. That friend argued that the Air Corps was about to undergo a huge boost in size that would increase opportunities for everyone and speed up promotions. The friend mentioned a new requirement from headquarters "to list all commercial [flight] time on the Form 5s of active duty officers, regular and reserve as a basis for seniority in assignments." He also mentioned the pay and benefits of serving on active duty, including the retirement system, were far better than any commercial airline likely had at the time in his estimation. More than that, though, he wanted his friend back in the Army. "I will say," he wrote Ritland, "there are darn few men that we need in the Air Corps more than your type. We have had to take several that I wouldn't give a dime a dozen for and all of the junior folks want to have your ilk back with us. . . . Do what you think best, fella, cause it's your life. However, we will be tickled to have you back with us."[106] On August 15, 1939, came both a telegram from the Army and a formal letter appointing Ritland a second lieutenant in the Regular Army. The letter assigned him to Hamilton Field, near San Francisco, the home of the 7th Bombardment Group, flying twin-engine, short-range, underpowered, underarmed Douglas B-18 Bolo bombers.[107]

But evidently the idea of returning to second lieutenant status with the nearly two-thirds cut in pay was a showstopper for Ritland.

Changing his mind about returning to active duty, he wired the Army in San Francisco on August 22 that "on further consideration, I decided that I would not accept this commission."[108] Then he returned to United Air Lines. But the Army decided to change his mind back for him, when, on August 23, they sent another telegram to the Ritland home in Oakland while he was away on a trip. The Army simply told him that because he had accepted the appointment, "SUCH ACCEPTANCE CAN NOT REPEAT CAN NOT NOW BE WITHDRAWN." Two hours later, according to the times stamped on the telegrams, Martha sent a telegram that met Ritland in Utah. It read simply: "RESIGNATION NOT ACCEPTED." He was ordered to decline through the adjutant general or through channels at the Presidio, wrote the Fourth Corps commander, or head to Hamilton Field. "With that kind of admonishment," Ritland recalled, he accepted the Army's "offer" of a regular commission and a return to active duty.[109]

Ritland soon headed to Hamilton Field and rejoined the Army in late August 1939, taking the oath of office as a regular officer. He had a new commission but was back at the bottom of the officer ranks as a second lieutenant again; his pay had gone from $290 a month with United down to $125; and although he had about 4,500 hours of flight time by this point, the Army assigned him as the third pilot on a B-18 bomber crew. But with the huge expansion of the Air Corps soon to come, flying time and promotions soon added up.[110]

On September 1, 1939, Hitler invaded Poland. World War II had begun, in Europe at least. Ritland's new problem would be to find a way to contribute to the war effort using the technical skills he had. It was not too long before he would get the opportunity.

Notes

1. *Official Army Register* (January 1, 1946), 581; and Notes for a speech.

2. Holden, *The Boeing 247*, 47.

3. James Parton, *Air Force Spoken Here: General Ira Eaker and the Command of the Air* (Adler and Adler, 1986), 88–89.

4. Robert E. Perry, "Boeing and the Turbulent Year of 1934," unpublished manuscript, no date, 30, San Diego Air and Space Museum Archives.

5. Benjamin D. Foulois with Carroll V. Glines, *From the Wright Brothers to the Astronauts: The Memoirs of Benjamin D. Foulois* (McGraw-Hill, 1968), 70,

hereafter Foulois, *Memoirs*; and General B. A. Schriever, "Suggested Luncheon Remarks in Honor of Maj. Gen Benjamin Foulois, Officer's Club, Andrews AFB, Maryland," July 21, 1964, Schriever papers, Box 174, Folder 3.

6. Foulois, *Memoirs*, 237.

7. Foulois, *Memoirs*, 240.

8. Perry, "Boeing and the Turbulent Year," 32.

9. Rickenbacker, quoted in Kenneth P. Werrell, "'Fiasco' Revisited: The Air Corps & the 1934 Air Mail Episode," *Air Power History* 57, no. 1 (2010): 17. The San Diego Air and Space Museum houses an extensive collection of Army Air Corps Mail Operation documents, although Ritland is not mentioned by name in the collection. See https://sandiegoairandspace.org/, accessed June 29, 2022.

10. Hopkins, *Flying the Line*, 55. According to author Perry, Lindbergh was "technical advisor to two companies [and] was cut in on stock terms which enabled him to clear nearly $350,000 without putting up any money of his own" ("Boeing and the Turbulent Year," 28).

11. Parton, *Air Force Spoken Here*, 89–90.

12. Holden, *The Boeing 247*, 111–17; and Foulois, *Memoirs*, 240–43.

13. Werrell, "Fiasco Revisited," 18.

14. Foulois, *Memoirs*, 241.

15. Werrell, "Fiasco Revisited," 18.

16. Arnold, *Global Mission*, 143.

17. Arnold, *Global Mission*, 143.

18. Foulois, *Memoirs*, 241.

19. Parton, *Air Force Spoken Here*, 89–90.

20. Holden, *The Boeing 247*, 111–17; Taylor, *High Horizons*, 86; Foulois, 242–43; and Neil Sheehan, *A Fiery Peace in a Cold War: Bernard Schriever and the Ultimate Weapon* (Random House, 2009), 20.

21. Thomas Alexander Hughes, *Over Lord: General Pete Quesada and the Triumph of Tactical Air Power in World War II* (Free Press, 1995), 40–41.

22. Sheehan, *A Fiery Peace*, 20.

23. Foulois, *Memoirs*, 249–50; see also "Enlisted Pay Chart 1922–1940," https://www.navycs.com/, accessed June 9, 2022.

24. Parton, *Air Force Spoken Here*, 90–91; and Foulois, *Memoirs*, 254–55.

25. Copp, *A Few Great Captains*, 189.

26. Werrell, "Fiasco Revisited," 17–18.

27. Hancock, *Training to Fly*, 265.

28. "Work Completed in 'Blind Flying'," *Riverside* (California) *Daily Press* (March 2, 1934), 6.

29. Ritland oral history, 12–13.

30. Ritland oral history, 16–17.

31. Werrell, "Fiasco Revisited," 19–20.

32. Maurer, *Aviation in the U.S. Army*, 311.

33. Holden, *The Boeing* 247, 118.

34. Foulois, *Memoirs*, 250.

35. Werrell, "Fiasco Revisited," 21.

36. Werrell, "Fiasco Revisited," 22–24.

37. Ritland oral history, 13–14.

38. Perry, "Boeing and the Turbulent Year," 41.

39. Parton, *Air Force Spoken Here*, 91; and Foulois, *Memoirs*, 259–60.

40. Holden, *The Boeing* 247, 119.

41. John F. Shiner, *Foulois and the U.S. Army Air Corps, 1931–1935* (Office of Air Force History, 1983), 148–49.

42. Foulois, *Memoirs*, 259–60. Foulois, incidentally, thought enough about Ritland to attend the latter's retirement dinner in 1965. Although in his 80s by that point, Foulois had been a ceaseless advocate for aviation since his own retirement in 1935 and had been on an official speaking circuit for the Air Force since 1959, traveling over "a million miles to tell the story of military aviation and stress the importance of airpower," according to one historian. The sentiment was returned when Ritland said at his retirement dinner that after retirement, "I am going to join [Foulois] as his co-pilot." John F. Shiner, "Benjamin D. Foulois: In the Beginning," in *Makers of the United States Air Force*, ed. John L. Frisbee (Office of Air Force History, 1987), 39–40; Foulois, *Memoirs*, 293; and Ritland, "The Ritland Fan Club," retirement dinner, on or about December 1, 1965, Trk 8, about 16:30 mark.

43. Kathy Wilson, "Weathering the Storm: The Army Air Corps Answers the Mail Call," *Journal of the Air Force Historical Foundation* 70, no. 2 (2023): 65.

44. Maurer, *Aviation in the U.S. Army*, 345–46. Total air corps appropriations: 1932 ($31.5 million), 1933 ($25.4M), 1934 ($23.3M), 1935 ($27.4M), 1936 ($45.4M), 1937 ($59.4M), 1938 ($58.6M), 1939 ($70.6M). (Maurer, 476.)

45. Arnold, *Global Mission*, 146. That is, he pointed out, until the B-17 came along.

46. Maurer, *Aviation in the U.S. Army*, 346–47.

47. Maurer, *Aviation in the U.S. Army*, 348.

48. Maurer, *Aviation in the U.S. Army*, 348–50; and Roger W. Lotchin, *Fortress California, 1910–1961: From Warfare to Welfare* (Oxford University Press, 1991), 67–69.

49. Maurer, *Aviation in the U.S. Army*, 350.

50. Memo, Capt V. Hine, 95th Pursuit Squadron Commander, to Capt Ira Eaker, 17th Pursuit Group commander, January 29, 1935, Ritland papers.

51. Ritland oral history, 1–3; Sheehan, *A Fiery Peace*, 26–27; and *Official Army Register* (January 1, 1946), 581.

52. "Many Shifts Looming at March Field as Mail Service Closes," *Riverside Daily Press* (May 8, 1934), 2.

53. "Officers Leave Service of the Army," *Riverside Daily Press* (May 21, 1934), 2.

54. Ritland oral history, 2–3; and Nancy Allison Wright, "Profile: Harold Turner (Slim) Lewis: Adventure Was His Middle Name," Air Mail Pioneers (1999), https://www.airmailpioneers.org/, accessed July 22, 2022.

55. Wright, "Major General Blazes Path in Air Force History," 8.

56. "United Adds New Daily Schedules," *United Air Lines News* V:1 (July 1935), 1, Archives, The Museum of Flight (Seattle); and "Harold F. Sweeney, "Portland," *United Air Lines News* V:1 (July 1935), 14, Archives, The Museum of Flight (Seattle).

57. "Biography of Brigadier General Osmond J. Ritland, USAF," April 24, 1959, Ritland papers; and "The Ritland Fan Club," retirement dinner, on or about December 1, 1965, Trk 3, about 11:00 mark.

58. Ritland oral history, 14–15, 28.

59. Ritland oral history, 15–16.

60. Holden, *The Boeing 247*, 52.

61. Holden, *The Boeing 247*, 53.

62. Museum of Flight, "Boeing 247D," https://www.museumofflight.org/.

63. Holden, *The Boeing 247*, 98–99.
64. Holden, *The Boeing 247*, 98.
65. Holden, *The Boeing 247*, 53.
66. Holden, *The Boeing 247*, 98.
67. Holden, *The Boeing 247*, 102.
68. Holden, *The Boeing 247*, 106.
69. Holden, *The Boeing 247*, 100. Ritland's flight records show he also flew a Ford Trimotor, but the number of hours is not listed.
70. Museum of Flight, "Boeing 247D."
71. Holden, *The Boeing 247*, 100.
72. Holden, *The Boeing 247*, 101.
73. Holden, *The Boeing 247*, 104.
74. Holden, *The Boeing 247*, 102, 104.
75. Holden, *The Boeing 247*, 103.
76. Holden, *The Boeing 247*, 99.
77. The reference is to the standard in rail passenger cars. Holden, *The Boeing 247*, 98–99.
78. Frank J. Taylor, *High Horizons: Daredevil Flying Postmen to Modern Magic Carpet—The United Air Lines Story* (McGraw-Hill, 1962), 69.
79. US Department of Commerce, Bureau of Air Commerce, Aeronautics Bulletin No. 1 (August 1, 1937), "Civil Aeronautics in the United States," 7–9. AFHRA.
80. "Portland Builds Airport on Island in the Harbor," *New York Times* (October 9, 1927), p. X18, ProQuest Historical Newspapers; Carl Abbott, "Portland International Airport," *Oregon Encyclopedia*, https://www.oregonencyclopedia.org/, accessed February 25, 2022. There actually was a flight training program established at Swan Island but not what you might expect. In the winter of 1931, following the Japanese invasion of China, the Chinese Flying Club of Portland formed to train pilots through the Adcox School of Aviation, eventually training 25 pilots to serve in the Chinese military in 1932 and 1933. (Trish Hackett Nicola, "'I Think I Am Going to Fly': Chinese Pilots Trained in Portland During the 1930s," *Oregon Historical Quarterly* 122, no. 4 [2021]: 532–45.)
81. Austin F. McDonald, "Airport Problems of American Cities," *Annals of American Society of Political and Social Sciences* 151 (September 1930), 221–83, cited in Janet R. Daly Bednarek, *America's Airports: Airfield Development, 1918–1947* (Texas A&M University Press, 2001), 76–78.
82. N. Houston Johnson, *Taking Flight: The Foundations of American Commercial Aviation* (Texas A&M University Press, 2019), 198–99.
83. "Swan Island Held Obsolete," *The Capital Journal* (Salem, OR), November 1, 1935, p. 10, University of Oregon Libraries; and *The Capital Journal* (Salem, OR), June 18, 1937, p. 3, University of Oregon Libraries.
84. Bednarek, *America's Airports*, 114–18.
85. "Airport Project Funds Reserved," *The Capital Journal* (Salem, OR), October 18, 1935, p. 16, University of Oregon Libraries; Abbott, "Portland International Airport"; and "United Mainliners Replaced on Coast," *Seattle Daily Times* (November 20, 1937), 4.
86. Johnson, *Taking Flight*, 200–201; and Bednarek, *America's Airports*, 100–106.
87. Roger E. Bilstein, *Flight in America: From the Wrights to the Astronauts* (Johns Hopkins University Press, revised edition, 1994), 98.
88. Bilstein, *Flight in America*, 104–7.

89. Ritland oral history, 2–3, 25.
90. Richard Bauman, "Link to the Future," *Aviation History*, May 2014, 49–50.
91. Bauman, "Link to the Future," 50.
92. Bauman, "Link to the Future," 50.
93. Taylor, *High Horizons*, 68.
94. Cameron, *Training to Fly*, 265–67.
95. Lloyd L. Kelly, *The Pilot Maker* (Grosset and Dunlap, 1970), 52–53. See also Stephen D. Chiabotti, "The Glorified Link: Flight Simulation and Reform in Air Force Undergraduate Pilot Training, 1967–1980" (PhD diss., Duke University, 1987), especially 45–49; and Maurer, *Aviation in the U.S. Army*, 378. Ritland almost certainly had training using an "Ocker Box," a primitive pre-Link Trainer device used at Advanced Flying School at Kelly Field. (See Hussey, *A Heritage of Service*, 47–48.) He probably didn't see a Link trainer until March Field in the mid-1930s, but he would have been familiar with them by the time he had his new training position at United.
96. Maurer, *Aviation in the U.S. Army*, 378–79.
97. Taylor, *High Horizons*, 69.
98. "Link Trainers," *United Air Lines News* VI:6 (July 1937), 8, Archives, The Museum of Flight (Seattle).
99. "Application for Regular Army Commission," Box 3, Ritland papers.
100. Caden Jenkins, "The Air Corps Reserve Officer," *Western Flying* (September 1932), 22–24, Ed Leiser collection, Box 2, Folder 20.
101. Maurer, *Aviation in the U.S. Army*, 435–38.
102. Lois E. Walker and Shelby E. Wickam, *From Huffman Prairie to the Moon: The History of Wright-Patterson Air Force Base* (USGPO, 1986), 145; and "Aircraft and Equipment," *Army Air Forces Statistical Digest World War II*, transcribed and formatted for HTML by Patrick Clancey, HyperWar Foundation (September 17, 2019), https://www.ibiblio.org/.
103. "Reserve Officers Receive Permanent Commissions in the Air Corps," *Air Corps News Letter* XXII:17 (September 1, 1939), 8, https://media.defense.gov/. Osmond Jay Ritland appears on page 9.
104. Telegram, Ritland papers.
105. George F. Hopkins, *Flying the Line: The First Half Century of the Air Line Pilots Association* (The Air Line Pilots Association, 1982, seventh printing 2010), 101.
106. Lt [no first name given] Hoplicker, letter to Ritland, August 12, 1939, Ritland papers.
107. "Douglas B-18 Bolo," National Museum of the United States Air Force (hereafter NMUSAF) (April 14, 2015), https://www.nationalmuseum.af.mil/.
108. Ritland, telegram draft, 335, Box 2, Misc papers, Ritland papers.
109. Ritland oral history, 3–4, 24–25. Copies of these telegrams are in Ritland's papers at Edwards. Ritland went from second lieutenant to lieutenant colonel in two years and to full colonel by 1945, four years after rejoining the Army, when he was 33 years old. Many of his contemporaries who stayed in the Army and did not go to fly for the airlines were colonels by age 28. His pay would have more than doubled as he both rose in rank and accrued time in service by 1945. See "1922–1942 U.S. Military Officer Base Pay Charts" (n.d.), https://www.Navycs.com/, accessed July 7, 2021. Emphasis in the original.
110. Ritland oral history, 24–25; and Notes for a speech.

Chapter 3

Flying During World War II

On Sunday, March 14, 1943, Ritland and flight engineer 1st Lt Nathan "Rosie" Rosengarten made a normal startup, taxi, takeoff, and climb to 19,500 feet in a plywood-framed de Havilland DH.98 Mosquito bomber loaded with simulated bombs. The USAAF had asked the Royal Canadian Air Force if they could borrow one for "full performance and evaluation testing." The Mosquito was considered the fastest twin-engine bomber in any air service, running on two Rolls Royce Merlin engines. Flight test division had assigned Ritland as the primary test pilot for tail number DK-287, which had been outfitted in American markings called rondels but otherwise looked like the British bomber that it was. He had flown it on five previous tests, totaling about 6.5 hours of flight time.[1]

Rosengarten recalled that the right engine coolant temperature was "right against the peg," but they took off anyway, expecting it to cool off at altitude. In their first test run, Ritland put the "Mossie" in a shallow dive to pick up speed and at 18,500 feet he pushed the throttles to full. In less than five minutes, they were going to have their "first data point and be ready for the next bit of data of [their] power calibration. In this type of flying," Rosengarten recalled, "the pilot practically flies on instruments and his eyes are glued to the instrument panel."[2]

While they were stabilizing at their new altitude, the engine temperatures began to rise, and the left engine temperature reached maximum just four minutes later. The cockpit began to get hot and then smoke entered while the bomber hustled along at 273 mph. Ritland decided to end the test, "pulled back both throttles, opened both radiator shutters, and turned east toward Wright Field in a power off descending turn." As he looked toward the left engine, he "noticed flames coming from the junction of the inboard [nacelle] and wing leading edge." Rosengarten saw the plywood "layers of this wing were beginning to separate, like paint peeling off an old barn."[3] This flight was now more than just another aviation problem to be solved; it was an emergency.

Fig. 4. RAF Mosquito, of the model Ritland had to bail out of in 1943. [Ritland family photo]

Rosengarten described Ritland's next reaction as "cool." Ritland reached out to shut off the left engine and pushed the button to feather the propeller, but the button did not stay in. He held it in until flying the airplane one-handed became more difficult. Ritland needed at least three hands because he could not hold the feathering button down and reach the idle cut off button and fly the airplane with just two hands. As the fire began burning through the wing just to the rear of the engine, Ritland realized he was not going land safely with that altitude and distance still to go to landing. He ordered Rosengarten to bail out. Although they had trouble opening the inner and outer doors, when they did, the cockpit cleared of smoke and at about 16,000 feet Rosengarten jumped out. As soon as he did, the inner door slammed shut. Ritland looked back and saw into the engine nacelle through burned holes in the plywood. It was a solid mass of red and white flames. He saw parts of the plywood wing surface tearing away and made his decision to jump, too. They had been in the air about 30 minutes.[4]

The plane's speed was now well over 350 miles an hour. He was going to have to bail out, anyway, which experts said was not survivable, but he did not have much choice. At about 14,000 feet, he released his safety belt and lifted his leg up past the control column but as he did so, he pushed it slightly forward, which threw him toward the top of the cabin. Reaching down, he pulled the control column back to level the airplane a little and then tried to re-open the inner door and get out. He had to climb through the exit and hold the inner door open until he was at least halfway through the opening. He realized his face and head might be injured as he slid through the exit, so he placed both arms in front of his face and fell clear of the airplane, blacking out as he did. Quickly recovering, he pulled his parachute rip cord, and when it opened, he got his legs caught in the lines, getting violently jerked and twisted. One riser was torn and was at the top of the parachute; only five lines were connected to the other riser, leaving just two risers intact. The parachute filled out, spilled air, and then filled out, again and again, all the way down. He later estimated that he was falling at 24 to 34 feet per second. Ritland finally landed hard at the edge of a wooded area and in a sandy creek bed. His legs collapsed and his buttocks slammed into the sandy ground, compressing three lower lumbar vertebrae, causing spine compression fractures. He was near Liberty Road and South Union Roads in Dayton, in the vicinity of what today is the local Montgomery County Fairground.[5]

Mrs. Charles Whitaker of Liberty Road heard an explosion about 11 a.m., one so powerful that it rattled the windows in her home. She told a local reporter that she "ran out to investigate the source of the explosion." Whitaker recalled seeing the plane blow up in mid-air and what she "took to be the right wing flew off to the right of the flaming mass and spiraled to the ground, smoking. The rest of the plane came down in flames in just a few moments, and exploded again as it hit the ground; the wreckage burned furiously, sending up dense clouds of black smoke and flames."[6] A local farmer took Ritland and Rosengarten to the hospital in his flatbed pickup truck, undoubtedly a painful trip for someone with a fractured back.[7]

The accident investigation board said that in its opinion, "the accident was a direct result of a fire caused by failure of the right exhaust manifold of the left engine."[8]

Ritland was off flying status for over six months as a result of his back injuries. He was in a military hospital about a month, he recalled, "in a plaster of Paris full body cast (neck to pelvis)." Then he was home for about two weeks at the Ritland family's small, two-bedroom, one-bath house on Tin Man Avenue.[9] Daughter Kathleen recalled that during Ritland's recovery, she sat on his bed and read *Peter Rabbit* to him. Six weeks after the accident, cast and all, Ritland went back to work in the flight test division. Five months later the Army removed the cast and restored him to flight status. He never had any back issues after the accident.[10]

Martha Ritland recalled this of her husband: "My memories and those of our two daughters—even from an early age—are clear and consistent. Our lives revolved around Ozzie's work and his dedication to it. For instance, in the course of testing a British Mosquito aircraft in [1943], the plane caught fire. He instructed his flight engineer to eject and then he ejected himself. His parachute caught on the small escape hatch and was damaged, causing him to descend too rapidly. He broke his back when he landed. This happened on a Sunday, which was a routine workday in the years during World War II."[11]

Rosengarten later recalled Ritland as "a superb pilot, a splendid gentleman and I am proud to have been his friend."[12] The two pilots connected for many years on the anniversary of the crash.[13] The British, incidentally, were having the same issues with their Mosquitos, which they eventually corrected by using stainless steel shrouds on the exhaust stacks, instead of wooden ones, and "by changing the hydraulic propeller line in the nose of the plane which had been breaking," according to an August 1943 letter about Ritland's performance.[14]

In August 1943, the Army awarded him the Distinguished Flying Cross, the "nation's highest award for extraordinary aerial achievement . . . awarded to recipients for heroism while participating in an aerial flight," according to the DFC Society.[15] The citation read, in part, that he received the award

> for extraordinary achievement while participating in aerial flights from 15 April 1942 to 14 August 1943. During this period [Lieutenant] Colonel Ritland conducted numerous flight tests of untried experimental airplanes and aeronautical equipment. Upon several occasions he was forced to make hazardous emergency landings as the result of fire or structural failure in flight. While engaged in a high speed performance test on 14 March 1943, Colonel Ritland saved his life by a parachute jump a few moments before his airplane exploded in mid-air. By his superior flying skill and complete disregard for his personal safety, he has contributed materially to the development of advanced types of aircraft which make possible the outstanding achievements of the Army Air Forces in the theaters of combat.[16]

The medal was primarily "for extraordinary aerial achievement" in the just over 16 months of service at Wright Field, during which he flew 1,740 hours, 30 minutes, including 1,450 hours of "purely flight test missions." During all these flights, only the Mosquito accident was a catastrophic loss, though "numberless times he has saved his plane at the risk of his life," wrote Maj Gen Charles E. Branshaw, commander of the Army Air Forces Materiel Command at Wright Field.

During the relatively lean years of the Great Depression, aircraft development had been a linear process: Buy one experimental aircraft and test it to its limits over a few years before ordering small quantities for the service. The Materiel Division spent most of its funds on maintenance of the existing air force with very little spent on new programs or experimental ones. The huge boost in funds that came with wartime preparations changed all that. The runup to war meant the service needed new models on a much faster schedule. The Army shortened its linear process, even buying new airplane designs "right off the drawing boards," without the manufacturer providing a prototype. Then, in an approach they called accelerated tests, manufacturers with track records of producing similar, reliable aircraft in the past provided an early production model to Wright Field, which put the new plane "'through the wringer' to ascertain its maximum speed, range, rate of climb, ceiling, landing and take-off runs, and other vital data," while mass production began.[17]

In his book *What Engineers Know and How They Know It*, historian-engineer Walter Vincenti put a finer point on what engineers do to make these contributions, especially with respect to "design." Vincenti contends that engineering knowledge is as valid a form of knowledge that needs to be derived as scientific knowledge. "For engineers, in contrast to scientists, knowledge is not an end in itself or the central objective of their profession." Quoting British engineer G. F. C. Rogers, "Engineering refers to the practice of organizing the design and construction [and, I would add, operation] of any artifice which transforms the physical world around us to meet some recognized need."[18] Ritland's story, therefore, is an example of a developmental engineer who applied those fundamental theories to the design of aircraft, missiles, and spacecraft to meet the recognized need of the moment.

Ritland flew fighters early in his career, but in his test career during World War II, he flew nearly 200 different types of airplanes, testing them to see if, among other things, they could accomplish the mission for which they were being designed. For Vincenti, design means the plans for creating an artifact like an airplane and the process for creating how the parts work together in that design. But design also means checking the artifact through mathematical analysis or experimental testing and then modifying the artifact based on what the engineers come up with, an iterative process that may take a while before a design is ready for production. Vincenti also differentiates between what he calls "normal design" and "radical design." Engineers know what to expect from a normally designed artifact, like how an airplane works, and would have a normal expectation of its accomplishing a desired mission. Wrote Vincenti, "Though less conspicuous than radical design, normal design makes up by far the bulk of day-to-day engineering enterprise. . . . 'For every Kelly Johnson [of Lockheed's Skunk Works] . . . there are thousands of useful and productive engineers designing from combinations of off-the-shelf technologies that are then tested, adjusted, and refined until they work satisfactorily.'"[19] These processes are where Ritland made contributions both before and after World War II by using his technical skills and leadership abilities to solve the problems of the moment.

Famed aviator Jimmy Doolittle recalled his time as an aviation engineer in the early days of flight when he worked on normally designed aircraft:

> You built an airplane and the two principal parts of that airplane were the structure and the engine. You designed the engine to the structure or more commonly the structure to the engine available, and then when you got that airplane you said, "Here is an airplane, and we will see what it can do." And it would climb like everything and go like everything and maneuver like everything. Then we said, "Now we will put on the necessary military equipment." So you began to install the guns, and you installed the bombs if it was a bomber, and you installed the photographic equipment that was necessary, and you installed the navigation equipment. By the time you got through it was a clunk. Usually this stuff would not fit, and you had to put bulges on the airplane in order to get the stuff in it. That was the opposite of systems engineering, and you were quite frequently delayed in the utilization of that airplane because some bit or piece did not get there on time and without that bit or piece you had nothing.[20]

In contrast, in "radical design," engineers do not know how the artifact "should be arranged or even how it works." The radical designs in Ritland's career are not the B-17 bombers or the P-51 fighters but the jet aircraft, the U-2 spy plane, the reconnaissance satellite, and the astronaut missions. Here, Ritland's contributions through his technical skills and his leadership are revolutionary. In his memoir, retired USAF Gen Curtis LeMay, born in 1906, pointed out that "in 1910 no one could possibly foresee the weapons systems which would evolve from the then crude flying-machines. Nor, where civilian usage was concerned, could anyone possibly foretell the vast transportation systems which would come into being. Man, in his exploration and management of this new field, brought incredible benefit to his brothers and sons—in the same moment when he effected his capability for wholesale eradication of the human race."[21] LeMay of course is talking about airplanes, intercontinental bombers and missiles, and nuclear weapons, which all would have been science fiction in 1910 but which Ritland helped make engineering fact. His engineering journey, which began in college but had been put on hold for nearly a decade, resumed in the skies over Ohio as the dark clouds of another world war approached.

With the start of the World War II in Europe in the summer of 1939, the United States added new energy to its preparations for war and there were many, many problems to be solved. For Ritland, that meant the Army's identification of him as a pilot who had a lot of flight time—his flight records indicate over 3,600 hours of "non-military time"—and a technical background, even though he had not graduated from San Diego State College.[22] He received a new assignment to Wright Field, at the experimental flight test organization, whose pilots eventually tripled in number with all the new arrivals.[23] In his application to the Air Corps Engineering School in February 1940 (which he did not attend), Ritland said he liked "engineering work better than any other." When asked if he was "interested in engineering from the standpoint of an engineer officer with a tactical organization, or from the development and experimental engineering standpoint," he answered that he was interested in either approach "but preferably experimental engineering."[24] Test flying was a perfect assignment for a pilot with that kind of experience and technical ability. As military assignments were public knowledge at the time, the *Seattle Daily Times* noted Second Lieutenant Ritland's reassignment from Hamilton Field to Dayton in its November 20, 1939, edition.[25]

Dayton and Wright Field are important places in aviation history. The Wright brothers operated a bicycle shop in town and ran a pilot training school at Huffman Prairie. Historians Lois Walker and Shelby Wickman described Wright Field of the 1930s as

> a kaleidoscope of aerospace science, engineering, technology, and education. As home of the Materiel Division and later the Materiel Command, Wright Field was the scene of engineering development and procurement as well as the heart of Army Air Corps/Air Forces logistical support . . . . Wright Field engineers and logisticians explored the concepts that provided the impetus for today's modern Air Force, and guided the techni-

> cal development of aeronautical equipment that was at the time the most sophisticated in the world . . . . Air-cooled radial engines, superchargers, controllable-pitch and full-feathering propellers, high-octane fuels, pressurized cabins, blind-flying instrumentation, free-fall parachutes, helicopters, flying wings, autogyros, gliders, and jet airplanes all have their special place in Wright Field history.[26]

By 1939, when Ritland arrived in Dayton, the area was "already a well-established research center with facilities and laboratories to develop and test experimental airplanes, engines, propellers, communications, armament and a host of other equipment. By the time of Pearl Harbor, it was already the largest aeronautical research and development center in the world."[27]

Wright Field at the time was the focus of the US military aircraft industry in the 1930s. Rather than building its own airplanes, the government contracted out to manufacturers and was supposed to receive a product that met "specifications like speed, rate of climb, service ceiling, takeoff and landing distance, and so on" to within 1 percent of the requirements when tested by government pilots. Manufacturers did not build a US Army airplane until pilots and engineers at Wright Field had "approved its theory, its performance, its production and every last millimeter of its structure." *LIFE* magazine asserted that "every dollar of the record-breaking $250,000,000 the industry [would] gross in 1939 owes something to Wright Field, whose mark is indelible on every airplane, civil or military, produced in the U.S. . . . Everything that goes into an airplane must meet Wright Field's rigid specifications. With the whole Army as its working laboratory, Wright Field is the biggest aeronautical experimental organization in the land. Langley Field (*LIFE*, April 17) concerns itself mainly with basic theories and truths about airplanes. Wright Field's job is to put the theories into practical use."[28]

Because of his engineering background and high number of flight hours, Ritland was assigned to the Flying Branch, which by that time had a long history of "flight testing of experimental airplanes, engines, aircraft accessories, and miscellaneous equipment" like flight suits and gear. Branch pilots also ferried new airplane models from airplane manufacturers to Wright Field for flight testing.[29] Col Stanley Umstead was the chief test pilot, supported by test pilots Ernest Warburton, George Price, and George Eppright. Ritland recalled that when he arrived, "there were about four or five pilots that were really doing the test work at Wright Field."[30]

Umstead and Warburton were experienced test pilots. Umstead served as chief of the Flying Branch from 1936 to 1941, flying over 2,000 test hours in over 100 types of new aircraft the Army was evaluating, including most of those that were to be used in World War II. He was something of a legend in the test pilot community by that point, having set an official transcontinental speed record from Los Angeles to New York in a B-17 in 1939. In 1941, Warburton took over the flight section. He had earned his wings in 1926 and graduated from the Engineering Course in 1931, arriving earlier in 1939 after graduating from Air Corps Tactical School when there were no paved runways at Wright Field, just grassy fields, three hangars, and one building for the test pilots and engineers and their two wind tunnels.[31]

Warburton had a reputation for being tough but fair and for caring about the health and safety of his people. Former test pilot Dick Muehlberg recalled Warburton as "a wonderful person and pilot . . . [who] kept his finger on the pulse of the organization and really pushed those of us who demonstrated a real interest" to succeed.[32] On one occasion, when Capt Hilliard (Don) Estes had a B-17E out on a test flight, he lost a propeller in a Sidney, Ohio, potato field, not meaning that the engine failed and he feathered the propeller but that the propeller actually came off the #1 engine and fell from 43,800 feet when the engine overran beyond 3,000 rpm. Estes did not declare an emergency until he landed, but when he walked into the operations building, he later wrote, "THERE 'HE' WAS. I mean Col. Ernest Warburton, Chief of Flight Test and my commanding officer. It was perfectly clear to me where the real EMERGENCY was going to be—right here, and NOW! HE was red in the face and his pointed devil's eyebrows were dancing a malevolent jig. . . . He was not mad about the propeller, which had concerned ME a lot. He explained in short, blunt Anglo-Saxon terms that our recent landing had been AN EMERGENCY, in capital letters. He wanted to see Fire Trucks, Crash Vehicles, Meat Wagons, MP's (you name it), all over Wright Field."[33] Jack Williams remembered that when he showed up to join the Flight Test Division, Warburton, for whom he "really had a lot of respect and admiration," handed him a slide rule and sent him over to civilian test pilot Paul Bikle to learn the ropes. One of Williams's first assignments was as Ritland's copilot on the Lockheed XC-69 Constellation, a four-engine plane. Recalled Williams about Ritland, with whom he also flew, "I learned a lot from that gentleman. An outstanding pilot."[34]

The Flight Branch carried out the majority of these "accelerated tests," flying "each production model night and day for 150 hours, simulating actual combat conditions to see how the craft performed to Air Corps specifications." Fighters were flown at full-throttle, half-throttle—fast, slow, high, and low—through every conceivable maneuver for the equivalent of more than a year of service for the airplane. Bombers were loaded with full crews and heavy duds to simulate the bomb loads and flown at high altitudes for as many as 18 hours nonstop, to approximate performance under regular bombing conditions."[35]

When a manufacturer had a plane ready for testing by the government, two pilots or engineers went to the manufacturer, received some instruction in how to fly the plane, and performed indoctrination flights. Then the government pilots flew the plane to Wright Field where they put the new plane through its paces using special instruments to ensure accurate results. Pilots conducted test flights seven days a week, weather permitting, and the contractor provided maintenance so the test flights could happen as early as dawn. If an airplane failed a test, another pilot took it up the next day and reevaluated it. If it still failed, it was back to the drawing board.[36]

Ritland made test pilot school in those days seem simple: For his certification flight, he took up a Northrop A-17A Gamma, a two-person, single-engine attack aircraft first flown in the late 1930s that he later called an "old A-17 dog." The test flight, he recalled, was to trial "the power calibrations and speed course runs, the power calibrations at altitude, sawtooth climb, time-to-climb, and all of those things to measure the performance." Because the test branch knew exactly what the answers were to the performance questions on the A-17, they had results to compare to the new arrival's results. "As soon as you finished that job," Ritland said, "you were a test pilot."[37]

That may have been true in summer 1939, but before a new test pilot could "take regular flight test assignments, there was an intervening 'practice' period of two to three months," according to an article in July 1941's *Air Corps News Letter*. New test pilots had to become "intimately familiar with the 17 items which compose the complete standard performance test" to ensure an airplane met the minimum requirements the government asked of the manufacturer. What takeoff and landing speeds does it need? How fast can the plane go at various altitudes? Does the airspeed indicator reflect the right speed? What rate of climb and descent can it achieve? Do the engines overheat? What does the test pilot think?[38]

To answer these questions, test pilots often had to fly at "constant speeds within plus or minus one mile per hour, or absolutely level flight instead of approximately level, and altogether [practice] a precise type of flying which wrings every ounce of concentrations out of the test pilot." Pilots measured takeoff speeds by trying to clear a 50-foot obstacle. Flaps were "set at various positions, from fully closed to fully open, to determine the best flap position for a minimum run and getting the airplane off the ground and over a 50-foot obstacle as quickly as possible. The landing tests [were] just the reverse—landing an airplane and braking it to a stop as soon as possible after passing over a 50-foot obstacle. The landing and take-off characteristics reveal, among other things, the minimum size of the base from which the airplane can be operated."[39] (In austere locations, this knowledge was especially important.) The final requirement was to fill out the 157-question "Pilot's Observations" questionnaire that asked the pilot for personal opinions on an "airplane's controllability, stability, trim, balance, maneuverability, interior arrangements of equipment and controls, and all-around characteristics in the air and on the ground."[40]

Fig. 5. Ritland attends to his checklist in a cockpit, likely of an XP-40 Warhawk, around 1939. [Ritland family photo]

Ritland kept the 1940 technical report of the A-17's performance in his personal papers, perhaps because it was his check ride to become a test pilot. The package included the data cards he used to record the mechanical functioning of the airplane along with his charts and calculations of the aircraft's performance. The cards sat on a clipboard strapped to a holder on his knee. He used a stopwatch to compute his timing for each test. A bar graph mounted behind the cockpit traced a record on a blackened paper cylinder. A fixed movie camera focused on a set of instruments, either filming readings or taking pictures during a test flight. The bar graph and film served as a check on what Ritland recorded on his knee cards. He tracked this airplane, tail number 35-122, at many altitudes, airspeeds, rpms, engine manifold temperatures, and other data points to determine the airplane's capabilities. On an early test, Ritland set the altimeter and noted it on his data card. After takeoff, he headed to the speed course, flying it at the approved low altitude and slow speed to make sure the plane could handle it, while also noting any crosswind over the course that might add errors into calculations. Then he could get ready for his first run, opening up the throttle far enough to reach the desired speed. For a fighter aircraft test at 19,000 feet, functional settings might include the propeller spinning at 3,000 rpm, the fuel mixture to auto rich, the throttle wide open, the flaps and gear up. When he passed the first set of markers for the speed course, he would start his stopwatch, note the indicated air speed, manifold pressure, torque meter, carburetor air temp, free air temp, oil temp, and cylinder head or coolant temp, and then when he passed the last marker, he'd head down to 18,000 feet and do it all again until he called it a day, a process lasting just about 90 minutes. Succeeding flights might be done at different indicated airspeeds or throttle settings or flap settings or any number of things. Planes had to be tested for climb rates and descent rates and turn ratios and dozens of other technical and performance elements, not just to see if the plane met its contract specifications but so pilots would know if it was a suitable combat aircraft.[41] Over the next several years Ritland would test literally hundreds of aircraft using these same basic procedures, offering his opinions, recording facts, and making or breaking a manufacturer's plans for an aircraft.

The next thing for Ritland after the A-17 check ride and his blessing as a full-fledged test pilot was to fly to Santa Monica with a more experienced test pilot, chief civilian test engineer Paul Bikle, to run tests on the Douglas A-20 Havoc, the first twin-engine, tricycle gear, attack aircraft.[42] Bikle later recalled that Ritland pointed out in his observation that the flaps and gear switches were too close together in the A-20A, which could have caused a catastrophic accident if a pilot selected the wrong one during an approach and landing.[43]

An Air Corps test pilot was a highly trained specialist who had to be extremely flexible. A typical day for a test pilot included one high-altitude flight and, frequently, multiple airplanes on the same day. The first flight of the day could be a 30-ton, four-engine bomber and the next could be "a tiny half-ton short-range liaison airplane, or any type in between." The effective horsepower a pilot might control on any given day might range from 65 to 6,000 hp.[44]

When the United States began its expansion to deal with the possibility of a world war, its combat squadrons mostly still included some of the first generation of America's open-cockpit, monoplane military aircraft like Ritland's P-26 Peashooter. Said Hap Arnold, "No one denies that we were short on types with which to go into mass production when this war broke out. We had only the P-40 and the B-17 types of combat planes but we were well fixed for trainers. . . . For the rest of our aircraft requirements, we had to embark on an extensive and hazardous program of buying airplanes on paper, without the usual service testing."[45] The generation of aircraft the United States used to win the war (like the Hellcat, Mustang, Corsair, Thunderbolt, and Liberator) were already in test or just about to make their debuts. But these planes and the others that followed still needed to be put through their paces to make sure the Army and Navy could rely on them "to serve their crews well and provide the necessary battlefield punch to destroy the hopes of the Axis powers."[46]

Arnold often visited aircraft plants and met with industry leaders. But Arnold also had a West Point engineering education, was a 1925 graduate of the Army Industrial College in Washington, DC (later the Industrial College of the Armed Forces and now the Eisenhower School for National Security and Resource Strategy), and had served as the commander of the air depot at Patterson Field in Dayton, where he was responsible for supplying airplane parts and engines to the Air Corps.[47] He had been commanding officer of some of the most innovative units and events in the air service since he got his wings in 1911. He understood, therefore, the problems of aircraft production. Recalled his aide and pilot Clair Peterson, "I think, due to his background, having been at Wright Field for some time, Rockwell [Field] also, and his close association with industry—I think production and procurement was probably Arnold's primary interest, the thing that he liked best."[48] In short, Arnold knew the aircraft industry and the people who worked at building airplanes all had to work together with the military for the new air force of his vision.

It was during one of those visits to Boeing in Seattle in March 1938 that Arnold arranged a foursome with Northwest Airlines pilot and former intercollegiate golfer Bernard Schriever. Arnold, Schriever, and Ritland had flown together at March Field and during the air mail fiasco. Arnold explained to Schriever that the new, larger air force was going to need airline pilots to help develop the multi-engine, all-weather bombers that were going to be needed for the war. Arnold convinced Schriever to take the regular commission exam again, which Schriever did, and of the 188 men in his group who took the oath for a regular commission, about two-thirds were airline pilots, according to author Neil Sheehan, who thinks that "Hap Arnold had passed the word to the examining board as to whom he wanted"—big airplane people with technical backgrounds.[49] After a brief stop at Hamilton Field, Schriever found himself a test pilot in Ohio. Other members of the "West Coast Air Force," like Ritland, soon joined him.

There was a formal process for selecting students to attend the Air Corps Engineering School, but in those days test pilots were selected "not by personal application, but from recommendations filtering through the service grapevine from other pilots," according to a 1941 article in *The Air Corps News Letter*.[50] Ritland was pretty sure Schriever "identified contemporaries with this airline experience" and had them assigned to the Wright Field test organization. Ritland reported to Wright Field with other former airline pilots like George Hatcher, Harvey Estes, and Clair Peterson, where Schriever met them.[51]

Before the war, the developmental process had been slow. Army Air Force R&D during World War II was mostly focused "on model improvement, on upgrading the performance, and just solving some of the mumps and the measles that kept occurring," said test pilot Donald Putt. "Of course, during the World War II period, the B-29 came into the picture. . . . So there was effort on new aircraft, too, but, dollarwise and personnelwise, I guess probably most of the effort was on trying to improve the aircraft that were in operations and in combat."[52] That is why there are B-17 models through the G-model.

As soon as the United States was directly involved in the war, the work the test pilots were doing at Wright Field took on a new importance for the lives of aviators in the European theater, even the test pilots who sometimes found themselves detailed to the European theater. From October 1944 to August 1945, Putt was assigned as chief of technical services in Europe. He recalled later, "Technical Services [was] a small extension of Wright Field. As such, then, we were, you might say, the technical arm of our own forces in Europe." Putt took the ideas from pilots and aircrew in theater and sent them to Ohio, where engineers and test pilots reviewed the ideas and modified them and then sent them back to Eighth Air Force for use in the skies over Europe.[53]

Among the projects Ritland worked on was developing longer ranges for fighter aircraft to provide better escort for bombers penetrating German airspace. Spitfires, designed to protect the United Kingdom in the Battle of Britain, were short-range fighters with an effective range of less than 500 miles. When escorting bombers, they could fly over to France and then had only enough gas left to fly for about 15 or 20 minutes in enemy territory, not enough to protect bombers from Nazi fighters or do any real damage to the Germans. Arnold worried that it "might cause us to postpone our Normandy landings." He took up the issue with the British, telling Air Chief Marshall Sir Charles Portal, chief of the Air Staff and his RAF counterpart, "It won't take very long [to modify the Spitfire]. I'll show you how easy it is to do it." Portal shipped three Spitfires to the United States on boats from England, with the promise that engineers would "put some tanks on them."[54]

The team at Wright Field began supersizing the range on the Spitfires with a new fuel system and by putting gas tanks "all over, inside and outside, and oh man, they had a gas tank in just about every little corner," recalled Ritland. Two months later the Spitfires had a range of 1,300 miles and, wrote Arnold with a bit of pride, "the Spits *flew* back to England." Ritland's fellow test pilot Capt Gustav Lundquist flew a newly modified long-range Spitfire to England through Greenland, landing in the UK on July 4, 1944. While there, Ritland recalled, "Old Lundquist went down to one of the fighter outfits and hornswoggled somebody into letting him fly a [P]-51" on a combat mission. Lundquist did not see any combat on the first flight, but he did not return from a second mission. As he told Ritland later, Lundquist "tangled with a Focke-Wulf 190, and it shot him down." Lundquist became a prisoner of war until the next year when he was liberated from *Stalag Luft 1*, made his way back to Ohio, and resumed his career as a test pilot.[55]

Most of Ritland's developmental test flights, though, were acceptance flights, trying to determine if the airplane met its contractual requirements for performance in speed, altitude, and takeoff and landing distance. For example, Bikle and Ritland found during two weeks of testing that the Douglas A-20 Havoc, which Arnold called "a splendid light bomber and night fighter," had a very serious cooling problem. With a certain kind of exhaust manifold, the engines would not cool, but the plane would go fast; with a different manifold, it would cool, but it would not go fast. A change needed to happen and fast so the planes could go into production. Ritland recalled that while he was doing his testing, two senior officers visited the Santa Monica plant where the A-20 was assembled. These senior officers negotiated personally with Douglas Company president Donald Douglas "exactly what [the company] would do right on the spot to get those airplanes out and in the service in 1941." The decision involved reconfiguring a certain number of airplanes and a penalty for not meeting contract performance, but the agreement allowed the service to get new aircraft quickly into production.[56] Douglas Aircraft eventually built thousands of A-20s.

In a less successful example, in May 1944, Ritland flew the McDonnell XP-67 Moonbat at Lambert Field in St. Louis. The XP-67 was "a mid-wing, laminar flow, single tail, fighter type airplane" with two engines, also known as the "Flying Fillet" because of the shape of the aircraft. Ritland and his colleagues flew the airplane five times over three days, totaling about 4.5 hours. They recorded weight and center of gravity information and details on the flight characteristics. They especially hated the cockpit layout, describing it as "only fair" with many controls and instruments "in the wrong place and in awkward positions." Some of the important switches were "difficult to locate and operate when used in the manual positions" and even the rudder pedals were "too widely spaced and . . . too high above the cockpit floor for comfort." Taxiing was "erratic and difficult," take off and initial climb were "poor," and the climb rate was "low" compared to other fighter planes. The plane did not handle well in tests of speeds, stability, and stalls. Furthermore, visibility was "very poor" because "the pilot is seated so low in the wing that side vision is restricted by the engine nacelles and rearward vision is poor because of the wing. . . . The pilot cannot see the wing tips from the cockpit, making formation flying difficult if not hazardous." He did not make any recommendations but did conclude that "the airplane was not good in comparison to present fighters . . . [and] not considered safe for the average military pilot."[57] The XP-67, Ritland said 30 years later, "performed reasonably well with regard to speed and maneuverability," but the Continental motor in it was not in heavy production at the time, and all the Allison and Merlin engines went into P-51s and other planes, so the XP-67 did not go into production.[58] In fact, the Army only completed prototype, which was the one that Ritland flew and that was destroyed in an engine fire a few months later.[59]

Over five years as a test pilot, Ritland flew nearly 200 different types of airplanes, ending up as the deputy chief of the flight test organization. He recalled it as "probably one of the greatest periods of my life in interest, freedom, flexibility, and accomplishments." All the test pilots flew all the airplanes, and they flew a lot. One day you could fly a "B-10, an L-2, a B-42, a B-32, a helicopter, an R-4, you name it." Typically, he talked to the pilot who had flown it first about "the fuel, landing gear, and all those important things" before jumping in the cockpit. But in those days, airplanes did not vary as much as they might today.[60] A photograph in the 1993 edition of the book *Test Flying at Old Wright Field* shows the operations board in 1941 and four officers. On the board are the current planes being tested and who the project officer is for it. Although part of the table is obscured, Ritland's name is definitely next to the Curtiss XP-40 Warhawk and Lockheed Vega Model 35.[61]

June 1940, a typical month for Ritland, involved him flying 20 types of aircraft. The Army was evaluating available commercial aircraft to serve as a new training airplane. They tested planes from Piper, Stinson, Fairchild, Erco, Rearwin, Bell, North American, and Spartan. Ritland had another close call during the July 1940 testing of Bennett Aircraft's BTC-1, a twin-engine, eight-seat aircraft made out of an early form of plastic called Bakelite and molded in a process called Duraloid, which created a very light aircraft.[62] After a morning flying a North American BT-14 trainer with Lieutenant Estes, Ritland made two afternoon takeoffs and landings in the BTC-1 with Bennett representative E. C. Long. Ritland recalled later the cleverness of the canopy hatch, which "was an efficient way to close the cockpit and unique for the period."[63]

But the newness of the BTC-1 was evidently also a distraction for the pilots. While Long was looking into the cockpit to explain some of the controls and instruments on their third evaluation flight, Ritland also took his eyes off the skies. They happened to glance up simultaneously and saw a Northrop A-17 fighter-bomber coming head on. Long shoved the wheel all the way forward. Down they went while the A-17 went up, its propeller just missing the BTC-1's cockpit. They "both looked at each other speechless [and] Ritland brought the ship in for a spiral landing [and] we both headed for the officers [club] for a drink." One said to the other (it is not clear which), "Too many eyes in the cockpit," and they both nodded. As they were drinking, the A-17 pilot came in the bar. He said, "Boy that was close, I never saw your ship until I saw . . . the flash of your cream colored ship as it went down." Long recalled that he was "all shook up because it was the closest one I ever had in an airplane. The A17 pulled straight up [and] we went straight down[,] both [doing] the wrong thing but it saved our lives." Long put in his logbook that day: "Fine ship—no criticisms—3 landings—likes ship fine very stable—did not try stall—likes idea of twin eng[ine] trainer—fine pilot and fellow." Ritland said to Long later, it was "probably the closest call I ever had I never knew about."[64]

Still, the test pilots concentrated on everything to make sure the planes could do what they were supposed to. And they flew. A lot. They flew seven days a week, whenever the conditions allowed it. Ohio had some dangerous convection currents, and cumulus clouds could prevent good test flying. Also limiting their test work, initially they had just a few experimental aircraft in the inventory, which Ritland recalled were "warmed-over versions of the existing aircraft. For example, the XP-37 was a long engine XP-40. Then they had a -47 on the books; the -38 was on the books. The P-63 was a light version of the -47; P-38Hs and all those were warmed-over versions."[65] But then came the hot rod.

Just as the war began for the United States in late 1941, Ritland went to Los Angeles to ferry a new airplane from the North American factory to Wright Field for testing. When the XP-51 made its debut in the test community, Ritland was one of the first to fly it, getting it to Ohio at speeds averaging about 350 mph, which is 100 mph faster than the P-40, then the Army's best fighter. The British had financed the development of the P-51, agreeing to give the US Army two airplanes to evaluate. The Allison 1720 engine "did not have good performance, especially at high altitudes, but it was a very sweet flying airplane," he raved, even at low altitudes. With the change of engine for the P-51B to the Rolls Royce Merlin "to give it high altitude performance, it was a wizard," Ritland recalled. Before the P-51, most aerial combat was at 28–30,000 feet, but the new Merlin engine could get the P-51 to 40,000 feet, giving the Mustang the height advantage and increased speed that every fighter pilot wanted. "And at Wright Field, we in the flight test division recommended heavily that the government procure P-51s," which it eventually did, ordering over 14,000 Mustangs, including almost 8,000 P-51Ds, which earned 4,950 air-to-air kills in the European theater alone.[66]

Not every airplane that Ritland and his fellow test pilots flew made it into production. In addition to the XP-67, Ritland also flew the Vultee XP-54, Curtiss-Wright XP-55, and the Northrop XP-56, all airplanes with pusher propellers, which he described as "experimental dogs, [that] contributed nothing."[67] But still there was a lot of development in aviation during the war. "The hottest airplane I flew at Wright Field in 1940 was the XP-40, and when I left there in 1944, we'd been up to the [XP-]82" Twin Mustang, an average of 10 new airplanes a year.[68] As aviation writer Budd Davisson put it in 2017, "The number of new designs, which during the '40s and '50s had seemed to pop out of the designers' heads into production on almost a monthly basis . . . slowed to a crawl. Now the gestation period of new designs, like the F-35, are measured in decades, not years, and threaten to span the entire 20-year career of new pilots."[69]

Ritland also had the chance to fly many foreign aircraft to compare them to American planes under simulated combat conditions against US aircraft. Test pilots could evaluate a plane's "climbing, diving, maximum speed, and maneuvering performance, as well as such matters as its controllability, handling qualities, usefulness of equipment, and engine performance," according to aviation historian Richard Hallion. This data was refined and the information then "issued to combat squadrons, essentially [as] a guide to combat pilots on how best to utilize their aircraft against an enemy airplane whose characteristics were now thoroughly understood."[70] Ritland's logs indicate that during World War II he flew a Japanese Zero, German Messerschmitt Me-109, Focke-Wulf FW-190, and Junkers Ju-88, as well as a British Hawker Hurricane, a Supermarine Spitfire, a Wellington bomber, and a Boulton Paul Defiant, in addition to the Mosquito he crashed. Eventually they even got ahold of a Me-262 jet fighter but "we never got that one in shape while I was there to fly," Ritland recalled.[71] He remembered the Hurricane and the Spitfire as "very fine airplanes. . . . The Spitfire was a fabulous airplane, beautiful flying airplane, probably better, at one time, than any of our American airplanes," albeit one with almost no range. The Me-109, though, was built with "a different concept, smaller, lighter wing loading than our airplanes, but very maneuverable."[72]

American pilots were not the only ones who flew their enemy's designs during the war. Engineer Hans-Werner Lerche had been a Luftwaffe test pilot since June 1941 when the first American aircraft he flew was a Lockheed Lodestar airliner that the Germans had captured in France in 1940. By June 1944, he had flown several types of Allied airplanes, including a P-47D fighter, a Lancaster bomber, a B-17G bomber, and a Hawker Typhoon fighter-bomber. Then on D-Day, Lerche received word that a P-51B had landed intact at Cambrai-South airfield, about 100 miles southeast of Calais, in German-occupied France. He had flown other American planes by that point and the Mustang's layout looked pretty familiar. With the early sunrise and a Ju-188 to escort him back to Germany, he took off just after 5 a.m. with the aircraft newly fueled and repainted "with the yellow captured aircraft identification." He remembered the Rolls Royce Merlin-powered Mustang was "a very exceptional aeroplane" as they made their way to a stop at Venlo in the German-occupied Netherlands, where the plane was quite popular with the local pilots. An hour later they were back in the air and shortly they were back home at Rechlin where he put the Mustang through its paces. Lerche recalled "that in comparative flights with some of our fighter aces only the Bf 109G-10 and the FW 190D-9 could more or less keep abreast with it." In an accident not much later on, another pilot and the P-51B were both lost.[73]

When the Army was having trouble getting airplanes to the European theater, Ritland made the first "tow tests" of a B-17 and a P-39 fighter. On the ground at 100 mph, the propeller wash of the big four-engine bomber was too much for the P-39 and the tests were taken airborne, but in the initial air test, the tow cable broke and Ritland and the P-39 pilot had to make emergency landings. He later flew many tow experiments in either a B-17 or a P-39 and got so good at them that he was able to hook a P-39 onto a B-17 in flight.[74]

Ritland flew performance tests on aircraft to help determine the safe operating limits for multiengine planes with engines out of commission by flying a four-engine B-17 on two of its engines and a two-engine Martin B-26 Marauder on just one engine. He conducted complete performance tests at the manufacturer's facilities for a half-dozen new airplanes and partial performance and flight characteristic tests on another half-dozen American and several foreign airplanes. As mentioned, he was one of the few pilots checked out on the Me-109E and the XB-19 bomber, a plane whose wingspan was over twice that of the B-17 and whose load was almost three times the B-17. Ritland was a long way from the P-26 Peashooter. He also flew spin tests on several aircraft, some of the most dangerous maneuvers a pilot can make in the air. The P-40E fighter and the AT-6A trainer aircraft were known as "bad spinners" until he put them through their paces and determined the safest way for pilots, especially new pilots, to recover from a spin, a task that likely saved a lot of lives while he risked his own. He also worked on pressurized cabins for the Lockheed XP-38A Lightning and the Boeing B-29 Superfortress. On several test flights when pressurization failed and the cabin filled with smoke, "emergency landings were necessitated," said Branshaw.[75]

There were other hazards in the air, too. When Ritland was flying a B-26 with modified wing and rudder surfaces, the electrical supply failed and the propellers went to full high pitch, putting enormous stress on the engines, requiring an emergency landing and a change to the propeller electrical system because of the test. In another instance, a broken exhaust manifold on the left engine of a B-26 led to an engine fire. "The flames were so severe and the danger so great that Colonel Ritland barely got the plane down and himself out of it safely. The ground crew had to extinguish the flames." When flying in a P-40F at 20,000 feet, the oil line broke, spraying oil all over the windshield and into the cockpit. Unable to see out, he made a safe emergency landing. And on a final approach in a Curtiss A-18 Shrike, when the throttle control suddenly failed, he had to turn off one engine and land with only one, considered "definitely precarious" in the A-18.[76]

Not every test pilot at Wright Field during World War II was a man. Ann Gilpin Baumgartner, later Ann Carl after she married P-82 Twin Mustang designer William Carl, was a WASP (Women Airforce Service Pilots) who had been towing drones for artillerymen to practice their gunnery skills at targets over North Carolina. She had a science background from her studies in college but had been fascinated with aviation since as a small child, her father took her to watch the mail planes come and go at Newark Airport in the 1930s.[77] She had put herself through flight school while working as a writer at Rockefeller Center in New York before joining the WASPs in January 1943.[78] She and another WASP found themselves in Ohio to test flight suits and seats that might be used for women pilots. They went into the altitude chamber without oxygen and were startled to learn what they were not capable of. Then in early March 1944, Baumgartner was assigned to the Flight Section at Wright Field where Col Ernest K. Warburton was the chief and Lt Col Osmond Ritland his executive officer. Baumgartner remembered meeting Ritland, who "looked the part—erect, tanned, direct and what pilots are wont to call the gaze of eagles. Colonel Warburton was dark-haired and rather stern, Colonel Ritland almost a redhead and quietly amused."[79] They all agreed she would start out as assistant to the branch operations officer, Capt Darrell Sims. Then Ritland took Baumgartner down to the room where the pilots generally gathered and paused at the door. "They know you are coming," he told her. In her memoir, she recalled what happened next. "The door opened upon a tableau of men in Air Force uniform, some standing, some sitting, in forced casualness. I saw curiosity, interest, friendliness, no smugness, no coarseness."

Ritland followed her in and addressed the pilots. "This is the WASP, which stands for Women Airforce Service Pilots, who has been assigned to FFT," Colonel Ritland said, referring to the fighter flight test division. "She'll be helping at the operations desk and learning what we do here, and how we do it." Then he turned to

Baumgartner. "I'll turn you over to Major Petrie, FFT chief, for introductions and explanations. Good luck, Ann," which she took to mean, "You're on your own now."[80] She remembered the group of pilots as "basically very diverse, yet in the Air Force context they looked at life in the same way, spoke the same language, faced the same fact of their mortality in this particular assignment in their wartime service. They seemed too mature and self-confident—or fatalistic—for any petty jealousies."[81]

In July 1944, there were 78 pilots and 46 ground officers in the Flight Section, dispersed into several branches like Flight Research, Base Engineering, Flight Test Engineering, Aircraft Control and Liaison, Accelerated Service Test, Bombardment Flight Test, Utility Aircraft, Fighter Flight Test, and Cargo, Training, and Miscellaneous Aircraft Flight Test and Flight Test Installations.[82]

She was very impressed by the test pilots' experience and professionalism at Wright Field, despite the fact that many of them were still in their 20s, and she "felt in awe of them and what they had done, what they knew about aircraft and about flying them."[83] Yet they were kind to her and accepted her as a member of the team. "They were such wonderful people," she recalled. "They were urging me to . . . fly. 'You haven't flown such and such. You haven't flown a P-47. Take one out.' Of course, I had to study up first." So, she hit the books to learn about the capabilities of the airplane. Following a check ride in a North American AT-6 Texan, a two-seat trainer aircraft that was the first fighter trainer for most World War II aviators, one of the test pilots took her outside to the flight line. While she sat in the cockpit, he stood on the wing and oriented her to the P-47's cockpit instruments. After that brief orientation, he said, "Go ahead," and she took the P-47 for her first flight. From then on, when she appeared on the flight schedule, she flew that day.[84]

Ritland's daughter Kathleen said in an email to the author that "our mother told us that Daddy never cared about male/female stuff. The character of the person was what mattered."[85] Baumgartner recalled in her memoir that "Colonel Ritland liked to see the planes in the air, not sitting on the field. He encouraged the Test Section pilots to fly as many planes as possible."[86] They put her through their same informal test pilot school, giving her an RP-47E to fly to take notes on performance and flight characteristics like speed, rate of climb, and stalling, like they all had.[87] She ended up flying dozens of different types of airplanes, large and small, fighters and bombers and cargo planes while she was there, including the B-17, B-24, B-25, C-46, P-38, P-40, and the P-51, which she called "a true blue airplane. . . . It didn't have any funny little quirks that you had to look out for."[88] She flew foreign aircraft as well like the Lancaster, Mosquito, Spitfire, Ju-88, and others.

Baumgartner also had a unique experience not many pilots ever had in the Dayton area. She spent time with Orville Wright, who frequented the flight test hangers at his namesake airfield. He was especially interested in jets, she recalled, because those engines were far beyond what the Wright brothers had achieved. He liked talking to the pilots who had been flying jets that day. When the test community held formal dinners or parties at Wright Field, the table arrangers always sat the unmarried Baumgartner and Wright together, which she recalled as simply "pretty nice."[89]

An opportunity she chalked up to being "just lucky" came when she had a chance to fly the Bell XP-59A Airacomet at Wright Field. Again, she got a cockpit orientation on the ground and then permission to fly it. When she took off, it even sounded different than propeller-driven planes. At about 300 feet above the ground, she recalled, the noise went away. She worried that there was an engine problem but then quickly realized that the sound was pushing away from behind her instead of being pushed into her by a front-end propeller. "That was a relief," she recalled, the first woman to fly a jet airplane.[90]

The test pilot's life was not easy even if it was free of combat. They flew almost every time the Ohio weather cooperated. And death was a constant companion. Arnold wrote in his book *Army Flyer* about "an older test pilot, the most skilled and respected in the flight section," who took a new plane out for spin tests. Barely surviving a test that put the plane into a left-angled spin, he landed and took the plane up for a right-angled spin, dying in a crash he could not recover from. Arnold also wrote about a pilot who, after three years of test flying, developed insomnia and began losing weight, eventually seeking out a flight surgeon who ordered the pilot to take three months of vacation time that he had been saving up, giving the young pilot a chance to rest and recover.[91]

While Ritland was at Wright Field, a special program emerged involving a modified B-29. A pilot there had little experience in the heavy B-29, and Ritland had to go to Muroc Field in California to run some performance tests on the XB-32, so he flew the modified B-29 and gave the pilot a checkout in the aircraft on the way.[92] "What I was doing, unknown to me at the time," Ritland recalled, "was beginning the ballistic tests" of the first atomic bombs by doing drop tests at Muroc Field. "I didn't know what they were doing. This airplane was modified at Wright Field for some big bomb, which I didn't know anything about. I went on and did my tests on the B-32 and left, went back to Wright Field, and never did know until later on, much later, that this was the beginning of the tests that finally ended up dropping the bomb at Hiroshima."[93]

The first jet fighters began to make their way into combat during this period, too. The most well known was the Me-262, which was operational in 1944 and that the Luftwaffe flew against American bombers. Col Laurence Craigie became the military's first jet test pilot when he flew the XP-59A on October 2, 1942. Wrote historian Richard Hallion, showcasing the simplicity that still remained in test flying, "Craigie familiarized himself with the cockpit, lit off the engines, taxied out, and took off."[94] Ritland also worked with the Bell XP-59A Airacomet, a single-seat, twin-engine jet fighter; Ritland tried to determine the jet's flight characteristics in preparation for more vigorous performance tests.[95] For national security reasons, Bell had shipped the airplane across the United States with a dummy propeller fixed to its nose and the Army had designated the plane the XP-59A "to confuse the project with an earlier, rejected propeller-driven fighter, the XP-59."[96] The difference between the Airacomet and any propeller-driven plane he had flown was immediate, Ritland recalled: "You taxied it out on the lake and, man alive, all of a sudden you took off. You never saw 400 mph on any airplane unless it was in a dive, and here you were [in the XP-59A] sitting there flying around 5,000 feet or 6,000 feet and reading an airspeed that you weren't accustomed to." The P-51 might reach 450 mph in a 30-degree dive at full power. But the XP-59A was underpowered compared to the Lockheed XP-80 Shooting Star, a single-seat, single-engine jet fighter that first flew in early 1944. The XP-80, which cruised at nearly 500 mph in level flight, was faster and had a better engine than the XP-59A and eventually went into production, though too late to see combat service in World War II.[97] But the XP-59A had given test pilots a glimpse of the future and it was coming fast.

To this point during World War II, Ritland had solved quite a few problems as a test pilot, some large like the Mosquito fire, and some small like the A-20 switch layout or incorporating a female test pilot into his organization. But as the war continued, more problems remained, and for some of them, the decision-making was going to be left to him.

Notes

1. Letter, Ritland to Dana Bell (December 21, 1986), Ritland papers.

2. Lt Col Osmond J. Ritland, "Pilot's Accident Report," April 23, 1943, Ritland papers; and Nathan (Rosie) Rosengarten, "Oh No—Fire in a Wooden Airplane!" in Ken Chilstrom and Penn Leary, eds., *Test Flying at Old Wright Field: From the Piston Engine to Jet Power* (Westchester House Publishers, 1993), 182–84. There is a 1991 edition of this book without the subtitle but unless otherwise indicated, all citations point to the 1993 edition.

3. Ritland, "Pilot's Accident Report"; and Rosengarten, "Fire in a Wooden Airplane!," 182–84.

4. Ritland, "Pilot's Accident Report"; Rosengarten, "Fire in a Wooden Airplane!," 182–84; and Ann Carl, *A WASP Among Eagles: A Woman Military Test Pilot in World War II* (Smithsonian Institution Press, 1999), 83–84. Fellow test pilot Ann Baumgartner reported that Rosengarten was wearing someone else's parachute that was too big for him and if he hadn't gone out the hatch feet first instead of the recommended headfirst, he might have lost the parachute completely.

5. Lt Col Osmond J. Ritland, "Pilot's Accident Report," newspaper clipping, Ritland papers; "Report of Aircraft Accident," May 3, 1943; "Ex-Test Pilot Takes Over as USAF's Missile Chief," *The Stars and Stripes* (May 7, 1959), Ritland papers; and Letter, Ritland to Dana Bell.

6. "Report of Aircraft Accident."

7. Montoya, email to the author, Subj: "Re: O. J. Ritland," March 8, 2022.

8. "Report of Aircraft Accident."

9. Montoya, email to the author, Subj: "Re: O. J. Ritland."

10. Montoya, email to the author, Subj: "Re: O. J. Ritland"; Montoya, interview; and Letter, Ritland to Dana Bell.

11. Martha Ritland, letter to the NRO, quoted in Robert A. McDonald, *Beyond Expectations—Building an American National Reconnaissance Capability: Recollections of the Pioneers and Founders of National Reconnaissance* (American Society for Photogrammetry and Remote Sensing, 2000), 306.

12. Ritland, "Pilot's Accident Report"; Ritland papers; "Report of Aircraft Accident"; Mrs. Charles Whitaker to Major E. McKesson, letter, March 14, 1943, Ritland papers; and Rosengarten, "Fire in a Wooden Airplane!," 182–84. A few weeks later Rosengarten was in a second Mosquito that

had been flown in from Canada by pilot Gus Lundquist and bound for Lundquist's hometown of Chicago, when an engine caught fire. This time, though, Lundquist was able to land the plane on one engine at Vandalia Municipal Airport.

13. Montoya, email to the author, Subj: "Re: O. J. Ritland." Rosengarten passed away in 2017 at age 101, after a successful military and civilian engineering career in the Dayton, Ohio, area. See https://www.legacy.com/, accessed March 11, 2022.

14. Memo, Maj Gen Charles E. Branshaw to Commanding General, AAF [Gen Henry H. Arnold], Subj: "Recommendation for Distinguished Flying Cross for Lt. Colonel Osmond J. Ritland," August 24, 1943, Ritland papers.

15. "Message from the DFCS President—Chuck Sweeny," The Distinguished Flying Cross Society, https://dfcsociety.org, accessed August 17, 2022.

16. Citation to accompany the award of the Distinguished Flying Cross, 278, Box 2, Misc papers, Ritland papers; and War Department, "General Order 90," December 8, 1944," 270-273, Box 2, Misc papers, Ritland papers.

17. Walker and Wickam, *From Huffman Prairie to the Moon*, 158–59.

18. Walter Vincenti, *What Engineers Know and How They Know It: Analytical Studies from Aeronautical History* (Johns Hopkins University Press, 1990), 6. The text in brackets is Vincenti's addition but it makes sense in this context as well.

19. Vincenti, *What Engineers Know*, 7–8.

20. Lt Gen James H. Doolittle, USAF, Retired, oral history, interview by E. M. Emme and W. D. Putnam, Washington, DC, April 21, 1969, 47–48, AFHRA, K239.0512-625.

21. Curtis E. LeMay with MacKinlay Kantor, *Mission with LeMay: My Story* (Doubleday, 1965), 535.

22. Individual Flight Record, Form 5, December 1943, Ritland papers.

23. Ritland oral history, 27–28.

24. Memorandum for Ritland, from Swafford, No Subj [Application for Air Corps Engineering School], February 5, 1940, 284–91, Box 2, Misc papers, Ritland Papers. He did not attend the Air Corps Engineering School.

25. "Army Orders," *Seattle Daily Times* (November 20, 1939), 21.

26. Walker and Wickam, *From Huffman Prairie to the Moon*, 117.

27. *Test Flying at Old Wright Field*, ix.

28. "Wright Field: The Army Tests Its Warplanes," *LIFE* (December 4, 1939), 78–85.

29. Walker and Wickam *From Huffman Prairie to the Moon*, 140.

30. Ritland oral history, 28–29.

31. James P. Coyne, *An Eagle's Flight* (Dorrance Publishing, 2001), 127. The Flight Test Division "Chiefs in succession were Colonels Umstead, Gillespie, Gilkey, Warburton, Bradley, Harmon and Boyd." See Nathan (Rosie) Rosengarten, "How to Keep Test Pilots Humble," in *Test Flying at Old Wright Field*, 220.

32. Dick Muehlberg, "Two Take-offs, One Landing," in *Test Flying at Old Wright Field*, 65.

33. Dr. Hilliard D. (Don) Estes, "Emergency? What Emergency?," in *Test Flying at Old Wright Field*, 3–5. Emphasis in the original.

34. Jak (Pappy) Williams, "From Slide Rule to Howard Hughes," in *Test Flying at Old Wright Field*, 146; and Bryan R. Swopes, "9 January 1943," thisdayinaviation.com (January 9, 2022), https://www.thisdayinaviation.com/.

35. Walker and Wickam, *From Huffman Prairie to the Moon*, 159.

36. *Test Flying at Old Wright Field*, ix–xi.

37. Ritland oral history, 29. The USAAF started a formal test pilot school in 1945 at Wright Field, eventually moving it to Muroc Field, now Edwards Air Force Base, California.

38. "The Job of Air Corps Test Pilots," *Air Corps News Letter* (July 1, 1941), 23.

39. "The Job of Air Corps Test Pilots," 24.

40. "The Job of Air Corps Test Pilots," 24.

41. "Profile of a Flight Test Pilot," draft script, 10–22, Ritland papers. See also "Profile of a Flight Test Pilot," YouTube, https://youtu.be/Zh4wJ24eUPw, accessed November 23, 2022.

42. Ritland oral history, 28–29; NMUSAF, "Douglas A-20G Havoc" (April 10, 2015), https://www.nationalmuseum.af.mil/; and C. Peter Chen, "A-20 Havoc," World War II Database (April 2007), https://ww2db.com/. Bikle later went on to lead flight testing at Edwards AFB for over a decade. See "Paul F. Bikle," NASA (April 22, 2021), https://www.nasa.gov/.

43. Master of Ceremonies, reading a letter from test pilot Paul Bikle during "The Ritland Fan Club," retirement dinner, on or about December 1, 1965. Trk 3, about 12:30 mark.

44. "The Job of Air Corps Test Pilots," 24.

45. Henry H. Arnold, "The Air Forces and Military Engineers," *The Military Engineer* 33, no. 194 (December 1941): 546. According to the Air Force Historical Foundation, the only kill credited to a P-26 came on December 12, 1941, during the Japanese invasion of the Philippines when Philippine Army Air Corps pilot Capt Jesus Villamor shot down a Japanese bomber. (Air Force Historical Foundation, email, Subj: "On This Day in Air Force History" [December 12, 2022].)

46. Hallion, *Test Pilots*, 154.

47. Clair A. Peterson, interview by Donald F. Shaughnessy, March 15, 1959, Columbia University Oral History Collection, 5, access for use by permission of Robert Arnold, email to the author and Columbia University, August 20, 2022, https://clio.columbia.edu/, provided as a PDF by file download; "General Henry H. Arnold," official biography (n.d.), https://www.af.mil/, accessed September 7, 2022; and R. Ray Ortensie, "A Look Back…Fairfield Air Depot," July 20, 2021, https://www.wpafb.af.mil/.

48. Peterson oral history, 5, 9; and Irving Brinton Holley Jr., *Buying Aircraft: Materiel Procurement for the Army Air Forces* (Center of Military History United States Army, 1989), 6–10.

49. Sheehan, *A Fiery Peace*, 26–27.

50. "The Job of Air Corps Test Pilots," 23.

51. Ritland oral history, 28–29.

52. Putt oral history, 40.

53. Putt oral history, 19.

54. Arnold, *Global Mission*, 495–96. According to British test pilot Jeffrey Quill, the Spitfire's frame could not handle the structural modifications and so the US modification recommendations did not get produced (Jeffrey Quill, *Spitfire: A Test Pilot's Story* [John Murray, 1983], 239–40). For a comprehensive look at the testing the British did in trying to extend the range of the Spitfire and how the testing compared to the P-51, see Paul Stoddart,

"Escort Spitfire: A Missed Opportunity for Longer Reach?," Royal Aeronautical Society (July 7, 2017), https://www.aerosociety.com/.

55. Ritland oral history, 36–37; "Test Pilot," *Time*, 44:9 (28 August 1944), 64; Gus Lundquist and Nathan R. Rosengarten, "Gus Lundquist Tests the MW-163," inset, in *Test Flying at Old Wright Field*, 219; and Arnold, *Global Mission*, 496. Emphasis in the original. Lundquist eventually rose to the rank of brigadier general and in the late 1960s commanded the Arnold Engineering Development Center in Tennessee ("Brigadier General Gustav E. Lundquist," official biography [April 1, 1968], https://www.af.mil/.

56. Ritland oral history, 31–33; and Arnold, "The Air Forces and Military Engineers," 546. It seems unlikely that the renegotiation was that easy in the absence of a contracting officer. For more on AAF contracting practices, see Holley, *Buying Aircraft*, especially Chapter 15, "The Negotiation of Contracts," and Chapter 16, "The Cost-plus-fixed-fee Contract: Negotiation and Administration."

57. Lt Col Osmond J. Ritland, "Memorandum Report on XP-67 Airplane, AAF No. 42-11677," May 19, 1944, Ritland Papers.

58. Ritland oral history, 42.

59. Adam Estes, "Today in Aviation History: First Flight of the McDonnell XP-67 Moonbat," Vintage Aviation News (January 6, 2025), https://vintageaviationnews.com/.

60. Ritland oral history, 31–33.

61. *Test Flying at Old Wright Field*, x. There is another photo of then-Lieutenant Colonel Ritland standing on the flight line with then-Lieutenant Colonel Harvey Estes, who is on crutches.

62. David C. Eyre, "Globe Swift," Aeropedia (May 8, 2019), https://aeropedia.com.au/.

63. Letters between Long and Ritland, February 16, 1975, undated draft but probably March 2, 1975; March 7, 1975; draft March 18, 1975; and March 28, 1975, Ritland Papers. The letters labeled "Long" are from Long; the Ritland letters are in Ritland's handwriting, likely drafts. The officer could have been Lt Col Harney Estes Jr., who was chief of the Fighter Flight Test Branch, or Capt Hilliard D. Estes, who was a pilot in the Bombardment Flight Test Branch, according to a July 1944 roster of members of the Flight Section ("Flight Section," July 12, 1944, Ritland Papers).

64. Letters between Long and Ritland.

65. Ritland oral history, 49–50.

66. Ritland oral history, 38–41; "North American P-51D Mustang," NMUSAF (April 20, 2015), https://www.nationalmuseum.af.mil/; "Curtiss P-40E Warhawk," NMUSAF (April 20, 2015), https://www.nationalmuseum.af.mil/: and Walker and Wickam, *From Huffman Prairie to the Moon*, 245.

67. Ritland oral history, 42.

68. Ritland oral history, 42–43.

69. Budd Davisson, "In a Lifetime of Flight," *Flight Journal: WWII Fighters from the Cockpit* (2017), 82.

70. Hallion, *Test Pilots*, 167.

71. According to the wartime diary's editor, civilian Luftwaffe test pilot Hans Fay surrendered his airplane in Frankfort. "Arnold directed that Fay be sent to Wright Field to assist US personnel in evaluating the aircraft, even suggesting that Fay test the Me-262 in mock combat against American fighters." Arnold, wartime diaries, Huston, 231, 274n33.

72. Ritland oral history, 35.
73. Hans-Werner Lerche, *Luftwaffe Test Pilot: Flying Captured Allied Aircraft of World War 2* (Jane's Publishing, 1980), 17–23, 116–19.
74. Branshaw memo, 2–3.
75. Branshaw memo, 2–4.
76. Branshaw memo, 4.
77. Carl, *A WASP*, 31.
78. Carl, *A WASP*, 29–35.
79. Carl, *A WASP*, 60.
80. Carl, *A WASP*, 62.
81. Carl, *A WASP*, 66.
82. "Flight Section," July 12, 1944, Ritland papers. Interestingly, probably because she was not a formal part of the Flight Section, Carl does not appear on this list of personnel.
83. Carl, *A WASP*, 66.
84. Ann B. Carl Collection (AFC/2001/001/06517), Veterans History Project, American Folklife Center, Library of Congress, digital video recording, approximately 29:00-41:45.
85. Montoya, email to the author, Subj: [blank], July 19, 2022.
86. Carl, *A WASP*, 77.
87. Carl, *A WASP*, 98.
88. Carl Collection, digital video recording, approximately 29:00-41:45.
89. Carl Collection, digital video recording, approximately 42:00 to 58:00.
90. Carl Collection, digital video recording, approximately 42:00 to 58:00.
91. Arnold and Eaker, *Army Flyer*, 55–57.
92. Ritland oral history, 135.
93. Ritland oral history, 135. The B-29 was first conceived of in 1939, finally reaching production in 1943. Recalled Arnold in his memoir *Global Mission*, "It was an airplane that weighed about twice as much as the B-17. With its gross load, bomb bays full, and gasoline tanks filled to capacity, it weighed 120,000 pounds, as against the B-17's 67,000 pounds under a similar load. It had about twice as much horsepower as the B-17. . . . [The B-29] was so large and complicated that it required about ten thousand drawings before it was possible to put in into production. A thousand engineers worked on that airplane. The drawings themselves cost us three million dollars. . . . We had one grief after another with the engines and other minor parts, mostly with the engines. Months of engine trouble; trouble with fires; trouble with cooling. Several times the planes caught fire in the air. . . . Eddie Allen, Boeing's chief test pilot, and one of the greatest the country ever knew, was flying" the first B-29 when it "caught fire in the air, and in spite of everything that could be done, crashed on landing, killing the entire crew." (Arnold, *Global Mission*, 477–78.)
94. Hallion, *Test Pilots*, 170.
95. Ritland oral history, 43–48, 77; and "Lockheed F-80C Shooting Star," NMUSAF (May 4, 2015), https://www.nationalmuseum.af.mil/.
96. Hallion, *Test Pilots*, 169.
97. Ritland oral history, 43–48, 77; and "Lockheed F-80C Shooting Star."

Chapter 4

Flying Overseas

On November 6, 1943, Ritland received travel orders for a special assignment that was to last approximately 30 days "in connection with AF matters."[1] He was to accompany Arnold's executive assistant and pilot, Clair Peterson, to Egypt to pick up the senior airman in Cairo and then, by way of Sicily and Foggia, Italy, and through Tunis, bring Arnold back to Washington. The Joint Chiefs and President Roosevelt were sailing to the Cairo Conference in mid-November 1943 aboard the battleship USS *Iowa* so they could get a little rest from the war and have some time as a team before meeting with their Allied counterparts. Arnold was planning to talk with the British about the conduct of "the strategic air offensive against Germany." FDR and Churchill needed to talk about who was going to lead Operation Overlord, the pending cross-channel invasion of France. Arnold recalled in his diary his thoughts on the spectacle that was a president arriving on a US warship, that the two seaplanes on board the battleship looked like "midgets," and that on their first night at sea he had had a "grand rest," possibly the first in a long time.[2]

Before Arnold sailed with the president on the trip, he called Peterson into his office and said, "Well, Pete, get a B-17 and meet me over [in] North Africa. I don't know where we're going to land [the *Iowa*]. I don't know what time we're leaving. But meet me over there." Peterson recalled later simply saying, "Yes, sir." He could estimate roughly when the dignitaries were going to land in North Africa but did not really know where, so he assumed it would be Tunis, which had been under Allied control since May.[3]

Ritland and Peterson took off from Washington's Bolling Field for the American airfield at Natal, Brazil, planning to hop across the Atlantic Ocean to another American base in West Africa. The B-17F's maximum speed and range were 325 mph and 2,800 miles, respectively. Leaving Bolling at about 10:30 p.m. so they could reach the next, unfamiliar stop in daylight, they got about 15 minutes out of Bolling when they lost all pressure in an engine, had to feather that propeller, and headed back to DC. The engine change took almost 24 hours, putting them way behind schedule to meet the ship. They eventually arrived in Dakar, Senegal, about 10 p.m. and immediately learned the *Iowa* was going to dock in Oran, Algeria, the very next morning, over 2,300 miles away, just barely inside the B-17's range.[4]

Peterson and Ritland checked the weather; Oran was fogged in. They called the base at Oran and talked to the Air Transport Command chief who told them not to worry because C-54s from Oran could fly the distinguished passengers on to Tunis. The next morning, with the distinguished visitors already en route, Peterson and Ritland headed for Tunisia where they finally caught up with Arnold at Spaatz's headquarters in the capital. Peterson, probably alone by this point, walked in to see Arnold, who said in an angry tone Peterson had no doubt heard before, "Where the hell have you been?" Peterson explained to him about the engine failure and the weather delays at which point Arnold said, "Don't worry about it." The DVs were all being tracked and had been assigned to certain airplanes for the next leg of the journey, which was to Egypt. Arnold told Peterson to follow the DVs to Cairo, which they did.[5]

Discussed in Cairo and then finalized at a stop in North Africa a few weeks later, the Allies put in place leadership changes both to press the efforts of the strategic bombing campaign and to get ready for the Normandy invasion. The most significant changes were the choice of Eisenhower as overall commander of SHAEF, Supreme Headquarters Allied Expeditionary Forces. Spaatz moved from deputy commanding general of the Mediterranean Allied Air Forces to CG of the United States Strategic Air Forces (USSTAF), as overall commander of the USAAF in Europe; Air Chief Marshal Arthur Tedder, RAF, went from allied air commander in the Mediterranean to Ike's deputy at SHAEF; Eaker was sent from England to press the campaign in Italy and the Mediterranean as Tedder's replacement; and Doolittle replaced Eaker as CG of Eighth Air Force.[6]

It was also at the Cairo Conference, Arnold felt, that Air Transport Command finally received the recognition it deserved for its actions in the China-Burma-India theater resupplying Allied forces. In one meeting, Chinese Nationalist leader Chiang Kai-Shek argued the Allies should try to retake Burma from the Japanese via amphibious assault, which would enable Allied coordination with Chinese ground forces from Yunnan province. The British did not want to press the attack and saw Burma as secondary theater. Roosevelt, however, who wanted to give Generalissimo Chiang Kai-shek something in Cairo to hang his hat on and to thank him for his support, agreed that an operation against Burma could proceed with American logistical support. FDR later backed out of this commitment because the AAF was struggling to deliver more than 10,000 tons of supplies a month over the mountains, flying over Japanese-occupied territory. Recalled Arnold,

> the amount of gasoline used by the airplanes in China was tremendous. Even if we increased the airplanes in China to the strength desired by the Generalissimo [Chiang Kai-shek] and [Gen Claire] Chennault, we would not be able to get enough gasoline [into China] to operate them, and continue to carry other kinds of supplies as well. As a matter of fact, before we finished our job of carrying supplies over the Hump, we had to build special tank airplanes—modified B-24's—just to carry gasoline. We stripped them of everything except the barest operating essentials and, installing gas tanks, loaded them to their maximum capacity with gasoline.[7]

Neither Peterson nor Ritland participated in the Cairo Conference, but the pilots had a chance to see the city. Arnold, who was billeted with Marshall in a villa on the edge of Cairo, suggested, "Pete, why don't you go duck hunting and bring us some ducks?" Peterson arranged with the local provost-marshal and an aide to King Farouk for six of them to go hunting. Although not mentioned in Peterson's 1959 interview, Ritland family stories include him on this hunting trip. Recalled Peterson, they "bagged" 150 ducks in all and distributed them among the villas of the conference's various dignitaries.[8]

On Tuesday, December 8, 1943, Arnold met Ritland and Peterson at the B-17 along with MSgt Henry Puzenski, Arnold's crew chief since 1934, an aide to Field Marshall Sir John Dill, the British representative to the Joint Chiefs in Washington, and Polish II Corps Commander Wladyslaw Anders, whose unit was fighting with the Allies in Italy at the time. They departed Cairo from Payne Field, at 1:10 a.m. While the pilots flew, Arnold slept all night on his coat until they landed at Tunis at 8:35 a.m. local time, where Brig Gen Edward P. Curtiss, chief of staff, North African Air Force, and Brig Gen Lauris Norstad, who was assistant chief of staff for Operations for the Northwest African Air Force, met them. From there it was on to Italy.[9]

Italy was not a pleasure cruise where Arnold did some sightseeing, met some senior leaders, and handed out a few medals, although he did do plenty of that. This was an inspection tour of the front. Arnold recorded these thoughts about his visits in Caserta, Italy, on December 11 in his diary.

> Hospitals, field and evacuation, ambulances, operating rooms, removing bomb and shell splinters from the soldier's head, pulling a mangled hand together, tying a body together after a shell fragment tore loose a hip and almost all of a buttock, wounds in the abdomen, holes in back and abdomen the size of a football, blood, transfusions, a scared Moroccan who refuses to have a tube put into a distended stomach to relieve suffering. Hands, legs, shoulders separately and together in plaster casts to rebuild broken and shattered bodies. Nurses doing their part, working overtime, smiling. Patients gritting their teeth and saying: "I'm feeling fine." All in tents with mud, mud, and more mud. The doctors working night and day, taking it all in their stride. A man with only half his innards dying but still smiling and saying: "I'm all right."

And Arnold made sure to record how close they were to the enemy, too, watching the antiaircraft artillery shooting at the German fighters overhead while Spitfires chased them down and infantrymen crouched behind any kind of cover. He also noted "German observers watching our movement up the road from the hill beyond . . . perhaps wondering who could be so foolish to come up there. Such was the view I had of the war in Italy, 60 miles north of Naples when our troops were meeting the Germans and wresting one mountain after another from them."[10]

A nice thing about Arnold's visit to Italy was that he could be reunited with his son, Maj Henry H. Arnold Jr., who was an antiaircraft artilleryman in Italy. They had not seen each other since 11 months before at the Casablanca conference. The 26-year-old mentioned to a reporter that "Dad brought me my Christmas packages" but "of course that wasn't his principal mission."[11] On his inspection tour of his forces in Italy, Arnold also got to meet with soldiers and airmen in the theater, making several young "dogfaces" pretty nervous, like Cpl Bob Fleischer, a *Stars and Stripes* staff writer who had never met a general. Fleischer recalled being pushed into a mess tent by a general officer and getting a plate with "a very fine slice of canned corned beef, a piece of GI cheese and a generous portion of spam—the spammiest spam" he had ever seen. Shortly thereafter Fleischer noticed Arnold going "to work on a piece of spam that might have been a twin brother to the one" on Fleischer's plate and he had the sudden realization that "generals are just like people." He was not nervous any longer.[12]

After a brief chat with the press, Arnold met Ritland and Peterson at his B-17 but found the big plane sunk up to its axles in mud. The bomber could not be moved right away, so he took Spaatz's B-17 for the leg to Tunis, where he was going to discuss with Ike the organization of Allied Air Forces. Meanwhile, "ground crews scurried with heavy equipment to pull out the big Fortress" and eventually Ritland and Peterson, having "gotten it out of the mud with a bulldozer," met Arnold in Tunis and headed for home.[13]

The uneventful flight home to the 35-day trip was across the Atlantic following the route dictated by the limitations of the B-17F. On Sunday, December 13, 1943, they flew the B-17 from Marrakesh, Morocco, to Dakar, Senegal, and then on to Belem, Brazil. The first leg was about 1,400 miles and the second leg across the Atlantic Ocean was about 1,900 miles, trips of six to eight hours each. There were 50 planes at Marrakesh and another 50 at Dakar where, in an indication of how much US industry had been churning out aircraft and the military training aircrews, they saw "hundreds of young pilots awaiting clearance for the Mediterranean or Britain."[14] After remaining overnight in Morocco, they headed across the Atlantic Ocean from West Africa to South America. Arnold took a turn at the wheel on the leg to Brazil, recalling, "During such flights I always took my turn in the pilot's seat at the control and flew the plane for a regular two-hour stretch. This enabled me to keep up my flying experience and gave me an opportunity to get acquainted with the latest gadgets on the newer type of planes. It also permitted the regular crew to have more time off and longer rest periods."[15] When he traveled, he rarely took a copilot with him and Peterson because Arnold usually sat as the copilot. "Although he never actually landed or took the airplane off," Peterson recalled, "he liked to navigate and he liked to be up there." Arnold "liked to figure the thing out so we'd hit the next check point right on the minute, and so forth. He got a great pleasure out of doing that."[16] The 1943 B-17 was a long way from the 1909 Wright military flyer in many respects, but flying still required many of the same skills. Then from Brazil it was on to Puerto Rico and Washington and after two more eight-hour flights, which Arnold wrote in his diary the B-17 called *Argonaut II* covered "quite handily," they arrived back in DC on December 15 at 4:25 p.m. Ritland's estimate on the back of his travel orders was 134:55 flight hours and 23,842 miles.[17]

Although Ritland's flight logs indicate the plane for this trip was a B-17F, there is no record of its tail number. The editor of Arnold's wartime diary, Maj Gen John Huston, says the B-17 flown back from Cairo was "Arnold's specially-equipped B-17," which Arnold says was called *Argonaut II*. A different B-17F with tail number 42-29817, also called *Argonaut II*, was already lost by June 1943 to enemy action and ditched in the Bay of Biscay with seven missing crew members by the time of the Cairo Conference. *Argonaut III* (42-29851) was also lost in combat in October 1943. Arnold, maybe unaware of the other B-17Fs called Argonaut, may have simply christened this B-17 *Argonaut II* after his own first B-17 *Argonaut* in which he was nearly lost while flying in East Asia in February 1943 when the pilot and navigator suffered from oxygen deprivation over the Hump, the first time the navigator had even been over 10,000 feet and unaware of the effects of oxygen deprivation. *Argonaut IV* was Arnold's C-54 that he used later in the war so there may have been another *Argonaut* or two for his use in between, or he may have learned of the lost B-17s named *Argonaut* and may have named the C-54 in their honor.[18]

Ritland did not keep a diary, and Arnold's diary does not indicate why Ritland was on this 22,000-mile trip. Was it because he was a newly minted Distinguished Flying Cross winner and Arnold wanted to meet the person whose medal he had signed? To check Ritland out? Was it because Ritland was a well-respected test pilot and had flown every model of the B-17 to that point and Arnold wanted to talk to him about the airplane? Ritland was a B-17 developmental test pilot whose files show he eventually achieved 250+ hours of flight time in every model of the B-17, B through G.[19] Perhaps Arnold just wanted to understand what Ritland was seeing in the newest model of the B-17. Did Peterson invite Ritland along because they were old buddies from March Field? Or perhaps Peterson was interested in a little "West Coast Air Force" reunion for the general.[20] Was Ritland simply next on some list to fly with the "old man"? Was Arnold considering Ritland for a role that he had discussed with Ritland's seniors, but he wanted to talk about with Ritland himself? We can only imagine what the conversations were like between Ritland and Arnold while they were both in the cockpit, the four-star general with the lieutenant colonel. "Ossie, the war's almost over," Arnold might have said, knowing Ritland had been in Ohio since 1939. "What are you going to do to get into the fight?" Is it coincidence that in the next 12 months Ritland got promoted to full colonel and command of an overseas base? Did Arnold have something to do with that? Arnold was obviously familiar enough with Ritland that, in the note in his diary about the arrival of the B-17 in Egypt, he only felt the need to write "Ritland" as one of the people on the arriving B-17.[21] Obviously the two aviators went back to March Field and the air mail fiasco that followed, so maybe Arnold remembered Ritland well enough. The fact that Arnold only wrote "Ritland" in his diary without fully identifying him indicates he knew who Ritland was and that he was supposed to be on the mission. These are questions we may never know the answers to, unfortunately. But Ritland was on a trip with the Commanding General of US Army Air Forces, which earned him a battle star for the Naples-Foggia Campaign and a European-African-Middle Eastern Campaign medal and, more importantly, a lot of time in the air with Hap Arnold.[22]

The last years of the war were a period of change for Ritland. After the journey to the Middle East and back, Ritland returned to his role leading test pilots, but not for long. Wartime promotions came fast and furiously in an Army that expanded as rapidly as the

US Army did during World War II, and for Ritland, promotions came quickly as well. He had returned to active duty August 15, 1939, as a second lieutenant, earning a promotion to first lieutenant at the end of 1940, to captain in February 1942, major a year later, and lieutenant colonel in January 1944. He achieved the rank of colonel on August 21, 1944. All of those promotions were temporary expediencies because of the war. Although he was paid as a colonel and wore the rank, his permanent rank remained first lieutenant, which he had achieved in the regular Army on August 15, 1942.[23] His permanent rank became lieutenant colonel in July 1948 although he still wore his wartime rank of colonel.[24]

Since 1940 Ritland had flown more than 2,300 hours in more than 200 different types of planes, including fighters, bombers, cargo planes, training aircraft, and experimental aircraft.[25] By 1944, he was executive officer of the Flight Test Section that had gone from six pilots when he arrived as a lieutenant in 1939 to over 100 test pilots.[26] But as the war continued, his turn to "get into the fight" eventually arrived.

Ritland received orders to report to the India-Burma theater but with no actual assignment given. While Martha took their daughters to California to be close to her family, he boarded an airplane on December 4, 1944, in New York City, carrying a suitcase, trench coat, and an air mattress, he recalled, flying on multiple C-46s, C-47s, and some new C-54s all the way to India, only stopping for one night in Karachi. When he finally got off the airplane in Calcutta at 7 a.m. three days later, the officers who greeted him, dressed "in their crisp bush jackets, and all rested and clean," said, "'What the hell are you doing here? We don't need you over here.'" He still was not sure where he was headed, so he joined them, sitting along the Hooghly River in Eastern India until the Army, Ritland modestly recalled, "finally made up an assignment at the Assam [Air] Depot."[27]

In fact, Ritland was posted on January 27, 1945, as the commanding officer of what would eventually be called Assam Air Depot, responsible for providing equipment and services to the groups flying over the Himalayan Mountains to supply Allied forces in China. The base was a permanent home for 82 officers and 1,372 enlisted men.[28] It was not a major aircraft maintenance site as we would consider a depot today but initially a transit point for aircraft and supplies. His search-and-rescue unit identified many crash sites, including some over 10,000 feet up the side of mountains. Air Transport Command flew fuel and equipment 24 hours a day, 7 days a week, "flying the C-46 airplane which had its deficiencies in reliability, propellers, and whatnot," according to Ritland, and C-54s and modified B-24s outfitted as tankers to ferry gasoline for the B-29s that were supposed to fly from China to bomb Japan.[29]

Fig. 6. Ritland addresses troops during his posting in India. [Ritland family photo]

Assam is a region about the size of Iowa in northeast India, with the Himalayas to the north and curving around to the southeast into China and then modern Burma.[30] It was tea and coal country in British-occupied India, whose rail lines reached from Assam to Calcutta to ships from the outside world. Those same rail lines during the war stretched from the ports into the interior of India, carrying supplies that soldiers loaded onto airplanes and crews flew into China in a supply chain that reached back to the United States.[31] Supply lines were over 15,000 miles, 12,000 miles across the Pacific Ocean from the West Coast of the United States, then a 1,500-mile rail journey to Calcutta, then travel over 1,100 miles on unreliable narrow-gauge railways to Dinjan and other airfields in Assam province. Then supplies had to be flown more than 550 miles to the nearest Chinese bases at Kunming by crossing the Himalayas with peaks rising above 16,000 feet and then an additional 450 miles to Chungking (now Chongqing), the Nationalist Chinese capital.[32]

After his visit to the region in 1943, Arnold believed that the area around the Assam airfields could be expanded to handle many more transport planes. Although the Ledo Road from Burma through India was not finished until January 1945, the road network in Assam was complete. It was going to be Ritland's task to expand the capability of Assam Air Depot to supply needs in China, including transporting the thousands of Chinese troops who were training in India.[33] Arnold also tasked LeMay's B-29s with bombing Japan from China, but it took "seven supply flights for each bombing strike, up to twelve gallons burned for each one gallon delivered." But the American people "howled like a pack of wolves for an attack on the Japanese homeland," recalled LeMay, "so the supply flights continued."[34]

The flights back and forth from India and China usually averaged about 500 miles. When compared to other routes flown by AAF transports, the Hump route was among the shortest. Yet they flew without radar altimeters, using just a compass over and through mountain passes that sometimes reached 15,000 feet or more with charts that were often inaccurate, in unpredictable weather that included thunderstorms, hail, and icing.[35]

The weather never seemed to cooperate, either. The sun got so hot, according to one account, that "the sun beating on fuel tanks in the wings of the aircraft heated the volatile gasoline close to the vaporizing point. It could happen, especially with C-46s, that after taking off for China, the plane climbed so rapidly that atmospheric pressure decreased faster than the gasoline cooled off, with the result that vapor-lock occurred in mid-air. When this happened to both engines at once, the plane was doomed and its crew might be[, too]." During monsoon season when it seemed to rain constantly, flying was also tough and building concrete parking areas for aircraft was equally impossible, but planes could not be parked in "the bottomless goo" of the rainy season.[36] And it was not just the flying or the weather that were issues, either. The British had warned US forces that casualties from malaria would reach 35 percent in the Assam-North Burma area because the British themselves had seen 50 percent casualties.[37]

Richard Knoblach, a lieutenant flying the routes over the mountains, wrote that the base Ritland commanded

> was up in northern India in Assam, which is tea country, where the tea plantations are, and within view of the big mountain, Mt. Everest. You can see Mt. Everest sitting up there, just that close, but a long way, 150 miles away. That was Assam. Chabua was the name of the base; a little village was named after the base there. The parking areas for the airplanes were PSP, pierced-steel planking, and pretty primitive. We lived in tea plantation houses, up on stilts, so you'd get air underneath and so the snakes wouldn't crawl up into the houses. We had lots of servants. I had a barber. The first thing I'd know in the morning when I woke up was I'd feel his brush. He'd work the temperature just about right so he wouldn't even disturb me. Pretty soon he'd start shaving me. It was an old horseshoe that he'd straightened out and smoothed the edges down, very sharp. It cost me 3 cents, I think, to get my morning shave, just lay there in bed. A pretty nice life. Your shoes were shined. . . . [The food] was adequate. We had a mess officer who treated the combat crews a little better than the rest of the people. He'd save stuff out. We'd come back from a mission. We'd be debriefed. Then when we were all on the ground, he'd start the cooking going, and he'd have this special stuff. Instead of powdered eggs, he'd have real eggs. Instead of meat that came from a tough Brahma bull, why, he had calf meat or veal. He looked after the combat crews. Treated them all pretty good. He said, "You guys deserve it."[38]

When Brig Gen William Tunner came in for his first landing at Assam Air Base in August 1944, he "could hardly fail to see the huge black splotches at the end of the runway . . . . Each was a lasting memorial to a group of American airmen, the crew of the plane that had crashed and burned at that spot." Tunner, overall commander of flying operations in the India-China Division from

September 1944 to November 1945, was shocked by what he found. "It was the accident rate which most impressed me—with horror! In January of 1944 there were two accidents (actually 1.968) per every thousand hours flown. Every two hundred trips over the Hump we lost an airplane. For every thousand tons flown into China, three Americans gave their lives," Tunner recalled in his 1964 memoir called simply *Over the Hump*. "In many cases in which there was reason to believe that some or all crew members had been able to parachute from their planes, the men were never seen again. The jungle had simply swallowed them up. The combination of a high accident rate with the hopelessness of bailing out was not conducive to high morale in the flying crews."[39]

Tunner took a Curtiss C-46 Commando twin-engine cargo plane like the ones memorialized by those black spots and flew it himself over the Himalayas—"the Hump"—into China. "I was the new commander of this unprecedented operation at the ends of the earth. Before I could properly command it, I knew I had to fly it, fly it with my own hands on the controls, my own feet on the rudders, my own eyes on the instruments."[40] The new commanding general had never flown a C-46 before but "had been studying the technical orders on it for months," he recalled. The passengers in the back probably did not need to know that. With a full load of supplies, the enormously heavy cargo plane "jounced and bounced" as they started their takeoff roll on the rough runway until they pulled up from "the hot, steaming, fetid valley of the Brahmaputra" River on their way to 18,000-foot mountain peaks. Circling over the airfield twice while they gained altitude, they proceeded southeast toward the Naga Hills. Ten minutes later they "had left the vicinity of civilization" and below them "the solid carpet of green was unbroken by any sign of life or human habitation."[41]

Over 400 planes had already gone down in this area, the crews lost amid the dense foliage, the victims disappearing into the jungle. There was nowhere for an emergency landing, so most crews bailed out of their crippled planes, parachuting into the heavily forested tropical mountains, home to locals purported to be "head hunters" but really "just mean and treacherous," or patrolled by the Japanese.[42] The region's Naga people were generally friendly to Americans, though, and because division intelligence branch chief Maj Robert

Wright had established relationships with the local British-built information network and some missionaries, many aircrew were saved. Wright devised the special silk patch sewn into flyers' jackets in five languages offering a reward for safe return and kept a safe full of gold coins in his office to pay the reward.[43] An injured man could also attract any number of illnesses to his injuries. A trained surgeon with a medical degree from Stanford University and time as a flight surgeon before the war, Dr. Don Flickinger was a pioneer in what would become known as "pararescue," or jumping out of perfectly good airplanes to save aircrew who had crashed in bad airplanes. On August 2, 1943, for example, he jumped into the Burma jungle 100 miles from base to rescue 20 survivors of a downed C-46 crew that included embedded CBS radio reporter Eric Sevareid.[44]

As Tunner and crew climbed above 10,000 feet, they watched the jungle thin out and above 16,000 feet the trees altogether vanished, replaced by "crags [that] were brown and bare and ugly, with an occasional patch of snow." On one "barren mountain was the gleam of aluminum, all that was left of an American plane." Looking on the map, they saw that it was the year-old remains of a C-87, a cargo version of the four-engine Consolidated B-24 Liberator bomber. As they flew on, they saw other crashes, checking them against their maps but seeing nothing new. Now an hour in the air and 125 miles out of Assam, they leveled off at 18,000 feet and increased their speed as they flew over the Himalayas and over Japanese-held ground. "The air was thin and cold, the oxygen mask was biting into my nose," Tunner recalled, "and my feet were freezing. An hour before I had been soaking wet with perspiration" in the operations building of Assam Air Base. As they passed over the mountains, the terrain changed yet again, and signs of human habitation reappeared in the rice paddies of the upper Mekong River. Their destination, the airfield at Kunming, China, was a 6,000-foot gravel runway that had been built by Chinese laborers with simple hand tools using rocks hauled from miles away in wheelbarrows. Three and half hours after they left Assam, they landed.[45]

The "reward" for Tunner and his crew was "real, honest-to-God eggs, not powdered, but fresh, fried in butter," cooked to order by local cooks, an improvement over typical Army food. Then a brief operations review before they headed back, this time climbing to

20,000 feet for the trip back, which they made in less time and with no return cargo. For Tunner, "The picture was clearer now. My flight, foolhardy though it may have appeared, had given me that insight I needed, an understanding I could have gotten in no other way. Though tired and tense, I was glad that I had done it."[46] Not long after, Tunner argued that flying the Hump should be "considered as hazardous as flying a combat mission over Germany."[47]

Ritland, although a base commander and not officially an Air Transport Command pilot, also flew all over the theater, including into China many times, with the flexibility that comes with command and rank to fly whenever he wanted over some of the most rugged terrain and weather in the world. "I flew all over on trips to China, over the Hump, and all around," Ritland recalled. "There again, you just had the complete flexibility of your own decision, and it was a very interesting area to fly over and the most rugged terrain that you can imagine. A lot of people went down and they'd bailout, and if they didn't show up in a month, they'd kind of mark them off. But a lot of them would come out of the jungle in a month. Many guys would bail out. You could survive in the jungles, but not for too long. The natives were generally friendly, depending upon the area that you were down in."[48] He doubtless flew several missions around the region, as Ritland's records indicate he had over 500 flight hours in the C-47 and 16 hours in the C-46, among all the cargo planes he flew, even if not all those hours were earned in the India-Burma Theater because some were likely earned as a test pilot.[49] In July 1945 he received "Battle Participation Credit" for two missions that were called "normal" flights and on which he served in January 1945 "as [a] member of air crew [flying] over battle zone set up for [the] India-Burma campaign" and the Central Burma campaign in March 1945.[50] This application earned Ritland credit for service overseas in a combat theater.

This mission was never easy, however. According to Air Transport Command historian and pilot Oliver La Farge, the early attrition rate was about 13.5 percent a month. Of 100 pilots in theater, 83.9 would still be flying after six months, 59.9 would still be flying after a year, and a mere 27.3 pilots would be available after 18 months. Each month after that, another five would be "lost to useful work." Pilots had to be sent home to ensure they stayed useful to the air mission.[51] Eventually, because of improved flight safety programs, radio-navigation equipment, and "special air traffic control and airport approach systems for maximum safe operation over congested airways . . . major accidents declined from 1.8 per 1,000 hours to 0.18 from January, 1944, to August, 1945." According to a report from after the war, "In January, 1944, a major accident occurred over The Hump every 552 hours, whereas in August, 1945, every 5,423 hours. A crew member lost his life every 162 Hump trips in January, 1944, but only every 2,925 trips in August 1945."[52]

By 1945, flying the Hump had become a major operation. In July there were over 300 airplanes flying missions and over 22,000 military personnel in India.[53] When they had stopped flying cargo into China in November 1945, "the India-China Division of the Air Transport Command announced 776,532 tons of war materiel were carried over the mountains into China between Dec. 1, 1942, and Nov. 1, 1945." They lost 594 aircraft, "910 crew members and 130 passengers killed or listed as missing, in the saw-tooth Himalaya range or jungles where the aircraft crashed." At its operational peak, the India-China Division was flying 46 percent of all Air Transport Command overseas flying hours and cargo worldwide, almost as much as Europe, Africa, and the Middle East combined. In July 1945 alone, pilots moved 77,366 tons of cargo with plans to move 120,000 in January 1946, delivering war materiel to China at the rate of 3.7 tons a minute. On its record day, August 1, 1945, according to the staff writers of the *India-Burma Theater Roundup*, "the division and aircraft under its control made 1,118 trips from India to China, involving approximately 2,000 crossings of The Hump. Some of the aircraft made three trips. . . . [The] great bulk of the transport job fell upon ex-civilians in uniform: lawyers, bankers, school teachers, bus operators, newspapermen and businessmen from all fields. They planned operations, organized personnel—including 50,000 [local] civilians—handled supplies, ran huge bases throughout India, Burma and China, and kept the aircraft in the air."[54] Said Tunner, "The age of air transportation was born right there on the Hump."[55]

When Ritland arrived in India in late 1944, the primitive days of living in tents and being attacked by Japanese bombers was in the past for America's airmen. The March 1944 Japanese invasion had failed, and by August the Allies were driving back the enemy in Burma. British, Indian, and American forces no longer had to worry about the Japanese cutting off the Assam Valley, its air bases, or Allied forces in China. The Ledo Road through Burma was soon completed, and the bases in Assam were safe to continue flying supplies into China over the Hump. Engineers completed building the 6-inch gas pipeline for 100-octane airplane fuel in May 1944, meaning fuel no longer had to be transshipped in 55-gallon drums over hundreds of miles. And in July 1944, the first members of the US Army's Railroad Battalion began moving supplies. New steel-framed hangars were being built where the newly arrived line maintenance crews could do 50- and 100-hour inspections on airplanes. Recalled airplane mechanic Rudolph Gaum, who arrived in Assam in 1943, "It became more like a commercial airline operation," running 24-hours-a-day, 7-days-a-week operations.[56]

But for Ritland, the romance of India did not last, and he began to look at it as "an obsolete theater."[57] As the war began winding down in spring 1945, the base's main assignment largely changed to disposing of equipment the Army did not want anymore. To make matters worse, the Army also stopped rotating people home who had been in the China-Burma-India Theater for more than 24 months because of the belief in June 1945 that the war was ending. But as the Assam Air Depot historian recorded, "There was no decided lowering of morale, as the optimistic [troops] managed to conceive a new set of bright rumors for the homesick, following the disappointing announcement. No one is particularly interested in being discharged from the Army before the defeat of Japan, but all are desirous of a short furlough after two years of foreign service. By the end of the year [1945] most of the personnel will have been away from home for more than 30 months."[58]

In October 1945, the War Department finally decided to reduce its footprint in the India-Burma Theater and to return the bases to the British. "Units, personnel and material were withdrawn from Burma completely by 15 December 1945," according to an AAF history, "and all responsibility for supply and service in the forward area reverted to the Assam installations headed by the Northern Air Service Command located at Chabua, Assam India. . . . By the end of the year [14] installations had been turned back to the British." Ritland's command at Assam Air Depot was assigned as the local collection point for AAF property, including spare parts, materiel to scrap, and even "combat aircraft and parts" intended for salvage.[59]

Regardless of its mission, life continued for Assam's personnel. According to the base historian, "The Indians working in a tea patch adjacent to the Signal warehouse roped a 12-foot python and had it on exhibition in the area. Many a GI decided then and there that life in India could be hazardous even though the [Japanese] had long since been driven out. Cecil 'Pappy' Jordan bought the skin for a souvenir and will no doubt relate to his grandchildren his exploit of lassoing a python in the jungles of India. It should make a good story."[60] Morale, though, was actually an issue as some soldiers went home while others stayed to finish the increased amount of work at the central depot in East India. The April 1945 official historical report for Ritland's group started off with the sad story of a corporal who died as a result of injuries he received in "in an altercation with a group of Indians."[61] Another Army historian described the morale problem as "tremendous," and while there was no substitute for morale to an individual receiving orders to rotate home, the Army did make efforts to make "just a few more months in India seem less dreary and dismal" by sending out more athletic and recreational equipment and pushing education through the "eight GI universities located through the theater [that] continued to function."[62]

Soldiers under Ritland's command at the Assam Air Depot built "one of the largest military warehouse structures in India" when the group of cooks, clerks, radiomen, and others without steel construction experience "who could best be spared by their commanding officers" joined three airplane hangars into a single supply warehouse big enough "to house a football playing field and grandstand."[63] When word of V-J Day finally arrived in August 1945, the base celebrated with a "buffet supper and beer bust. The squadron cooks outdid themselves," said the base historian, "with their delicious potato salad, ham salad and cold cuts with fresh buns to make sandwiches. The only complaint about the party was that everyone ate so much they couldn't drink as much as they wished."[64]

With the end of the war, the airlift began to decline. "The official figures tell the story: July, 1945, 71,042 tons; August, 53,315 tons; September, 39,775 tons; October, 8,646 tons; November, 1,429 tons. At the end of November, the Hump was officially closed, with just a few special mission flights over the route . . . made thereafter."[65] Although dozens of units were being deactivated or sent home en masse, according to a chronicle of events written at the time, "On V-J Day there were 5,019 officers and 42,616 enlisted men and women who wanted to go home; on 31 December 1945 there were still 954 officers and 7,034 enlisted men who wanted to go home."[66]

As the footprint shrank, Ritland had responsibility for turning back the outlying airbases to the British, who still ran the government in India. He recalled later that "we sold the hardware to the Indian government for three cents on the dollar—those things that were not military-useful. It took a long way to get that stuff completely one-half way around the world, finally up into the end of the jungle on a narrow gauge railroad train, and then leave it there. But that's war."[67] Conditions also got worse for pilots flying cargo. American pilots fell back on their "Combat Cargo" operations training. According to the *India-Burma Theater Roundup*, the theater command's official newspaper produced in New Delhi, starting in mid-November, Assam Air Depot pilots had to start flying "by the seats of their pants" again, often merely by following the Ledo Road for direction, because all radio navigation aids had been pulled out. Flying was permitted only under "CAVU" conditions (ceiling and visibility unlimited).[68] Mechanic Gaum recalled that "Chabua was said to be the busiest airfield in the world with transient aircraft just passing through in addition to the assigned bomb group, fighter squadron, troop carrier squadron, search and rescue unit, two squadrons of C-46s consisting of 65 planes, and needing to provide support to the surrounding airfields. But at least there was a PX that served Coca-Cola and beer."[69]

As the end of February 1946 approached, Secretary of War Robert P. Patterson said that all US forces in India and Burma would be withdrawn as soon as surplus property could be disposed of, suggesting that all US personnel in the theater might be out by July 1, 1946, except for the few air force personnel to run the depots for the regularly scheduled flights to get troops home.[70] Brig Gen

T. B. McDonald, CG of HQAAF I-B Theater, set a target date of June 1, 1946, for closing out all AAF activities in India in what he called "Plan Exodus." By March 1, all AAF personnel were at one of six bases stretching from Karachi to Calcutta. On March 30, 1946, the local government took over Assam Air Depot, including 3,000 tons of supplies worth $11.5 million the Army intended to leave behind.[71]

The logistics of the end of the war did not interest Ritland, so he put in for a transfer. The Army had assigned all the service groups to him as the Assam Air Depot commander. Five months after V-J Day, marking the end of the war, of the 22 airfields in the Northern Area Service Area Command (which had also been disestablished), the only airfield left was Ritland's Assam Air Depot, and the region had been reduced from 40,000 personnel to 800, most of them at the depot where they took care of surplus property until the buyers could pick it up.[72] "Then," he recalled later, "they began to phase it out, so it was more of a phase-out job than an active job. It was a disposition of equipment. It was the tail end of the war and I personally put in for cooks and bakers' school, for any kind of a course that came along, to get out of there, because it was not my bailiwick at all."[73]

Yet these airmen had proved that supplies could be airlifted long distances in an emergency. In its official history of the war, the US Air Force boasted that "here the AAF demonstrated conclusively that a vast quantity of cargo could be delivered by air," forcing military and civilian leaders to rethink what airlift could do, and setting the conditions for the Berlin Airlift of 1948–49 and to operate it successfully. "When the Korean War in 1950 required the emergency delivery of large numbers of men and equipment to the Far East, the precedents and the techniques for doing so were at hand," the Air Force wrote.[74]

In January 1946, Ritland applied for the Command and General Staff School's new program called the "Command Course." CGSC, which had remained open during the war, was still pumping out staff officers in a shortened version of its program, which focused not on command but on general staff skills. After nearly 14 months overseas, Ritland finally received his transfer when he was sent to Fort Leavenworth, Kansas, in mid-February 1946 to reunite with his family and participate in his first professional military education in the Army.[75] By now Ritland was too senior in rank to join the typical CGSC course for majors but he was exactly the type of officer for the Command Course.

Before leaving, Ritland left a letter to the members of the Assam Air Depot, expressing his regret in leaving them and his admiration for the depot's "marvelous job, which in many cases has gone unnoticed while other units were performing a more glamourous and spectacular job. That part of history has already been written and gives ample recognition to the contribution we made to final victory." He offered his thanks to the men "for what you have accomplished in the face of privation, hardship and disease," assuring them that "the same qualities you have shown in your work here will aid you in whatever new career you may enter."[76] In 1959, Ritland received a letter from David Brown, who had been Ritland's information and education officer in India. Brown saw an article in his local Minnesota newspaper about Ritland's promotion to two-star general and offered congratulations. Said Brown, "I considered you the best CO I had to serve under in World War II. You certainly deserve anything the Air Force gives you." Ritland replied with his thanks and "with reference to your comment about my being the best Commanding Officer, I have only one thing to say—a CO is only as good as the men who serve under him."[77]

Although Ritland no doubt had a long trip stateside, Martha, Kathleen, and Susan met him in Kansas, where they had a little house in the community of Sunflower for the Command Course. Kathleen remembered "always playing outside" and how "hot and dusty" it was but how glad she was to be back with her father.[78]

CGSC Commandant Maj Gen Karl Truesdell envisioned the course as a follow-on to the General Staff Course, which Ritland did not attend. The new course was "aimed at officers who would be generals in 1955," according to Truesdeell.[79] (That turned out to be almost on schedule for Ritland as he pinned on his first star in October 1956.) An officer selected for the program "had to be a combat-experienced lieutenant colonel or better, have superior ratings, and a C&GSS graduate," which Ritland was not.[80] Army War College had been closed for the war, but the command course, whose second and final iteration began Friday, March 1, 1946, included a lot of the same material as a war college curriculum, "with theater planning, mobilization training, and regional studies the principal learning activities." The five courses of the second Command Course were reviews of staff operations, regional studies, analysis of recent combat operations, analysis of current and future problems, and theater and task force planning. Guest speakers such as J. Lawton Collins, Jacob L. Devers, William J. Donovan, James M. Gavin, and Curtis E. LeMay supplemented the coursework.[81]

Students came from the air, ground, and service branches of the Army, mostly using small groups to solve problems in what a general officer described as a "super-duper, extra-special training course, designed for the Army's better minds."[82] Ritland recalled that the Army had brought "back senior colonels that had diverse experiences in all combat overseas operations . . . [where we could] exchange ideas, to relate experiences, [and] to document your feelings on things." They had discussions about new technological developments, wrote papers, rehashed major battles, and did tabletop battle simulations. Ritland felt "it was very interesting then to talk to the guy that said, 'Look, I was there and this is the way it was.' That was the interesting part of it. You could see a great battle, the Battle of the Bulge, and here you've got this guy who was there."[83]

Ritland graduated July 29, 1946, from the second (and final) Command Course. Records provided by the Fort Leavenworth archives show that he ranked 76 out of 101 students.[84] After five months in Kansas, and with the war over for nearly a year and the military demobilizing quickly, the Army decided not to return Ritland to India or discharge him from the service. He was, of course, a regular officer, not a reserve officer, which likely played a role in his retention in the military during the postwar drawdown. Instead, with 7,200 flight hours already in Ritland's logbook, the air service sent him back to Ohio where he could continue engineering the future.[85] The next set of problems to emerge came from a new enemy to be deterred from war.

Notes

1. Extract of Special Order No. 281, November 6, 1943, 268, Box 2, Misc papers, Ritland papers. On the back of the orders, Ritland kept track of dates, each stop, time in the air, distance flown, and average ground speed.
2. Arnold wartime diary, vol. 2, 73, 75, 125n138.

3. Clair A. Peterson, interview by Donald F. Shaughnessy, March 15, 1959, Columbia University Oral History Collection, 11, access for use by permission of Robert Arnold, email to the author and Columbia University, August 20, 2022, provided as a PDF by file download.

4. Peterson oral history, 11; and "Boeing B-17F Memphis Belle," NMUSAF, https://www.nationalmuseum.af.mil/, accessed August 17, 2022.

5. Peterson oral history, 12.

6. Henry H. Arnold, *American Airpower Comes of Age: General Henry H. "Hap" Arnold's World War II Diaries*, vol. 2, John W. Huston, ed. (Air University Press, 2002), 127, 128n154. Hereafter Arnold diary.

7. Arnold, *Global Mission*, 417; and Arnold diary, 71–73.

8. Peterson oral history, 12–13. According to the Ritland family, while in Cairo, Ritland went duck hunting with the King Farouk I of Egypt and enjoyed some of their winnings with a dinner (Montoya, interview).

9. Arnold diary, 96, 125n135.

10. Arnold diary, 100.

11. "Arnold Predicts Nonstop Bombing Against Germany," *Stars and Stripes* (December 13, 1943), 4.

12. Cpl Bob Fleischer, "Spam's Spam to Both General and Corporal," *Stars and Stripes* (December 14, 1943), 3.

13. "Arnold Predicts Nonstop Bombing ," 4; and Arnold, *Global Mission*, 476.

14. Arnold diary, 74, 102.

15. Arnold, *Global Mission*, 389.

16. Peterson interview, 1, 24.

17. Arnold diary, 102; and Extract of Special Order No. 281, November 6, 1943, 269, Box 2, Misc papers, Ritland papers.

18. Form 5s, Ritland papers; Arnold diary, 102, 128n161; Arnold, *Global Mission*, 410–12; Roger A. Freeman with David Osborne, *The B-17 Flying Fortress Story* (Arms and Armor, 1998), 127; Peterson interview, 17–18; and Patrick J. Charles, email to the author, SUBJ: "Re: Hap Arnold's B-17 in 1943" (September 26, 2022). Argonauts, from Greek mythology, are the band of heroes sailing with Jason in search of adventure.

19. Flight records, Ritland papers, see appendix.

20. Peterson interview, 21.

21. Freeman and Osborne, *The B-17 Flying Fortress*, 99; and Henry H. Arnold papers, microfilm Box 3, Reel 3, Library of Congress. "Ritland" appears in Arnold's handwriting and in the typed version of the diary he kept on the trip. It also appears that way and is annotated in the Huston annotated version on pp. 96, 125n135. Online Army records do show another Ritland during World War II, 1st Lt Gaylord O. Ritland (who along with his crew became a prisoner of war when B-17F, tail number 42-5055, was brought down by flak during a raid on Wilhelmshaven on May 15, 1943) and at least one Ritland in the Navy. It is unclear what relationship Osmond and Gaylord had. (See "Gaylord O. Ritland," American Air Museum in Britain [September 24, 2014]), https://www.americanairmuseum.com/. It appears from a Ritland family genealogy site that Osmond Ritland "was the son of Osmond, and grandson of Ole O., one of John (Jens) Ritland's brothers, which would have made him my father's 2nd cousin, and they were stationed together in India during WWII." (See "Ritland Family History," https://www.ritland-32nd-iowa.com/, accessed June 7, 2022.)

22. "Certificate," 263, Box 2, Misc papers, Ritland papers.

23. *Official Army Register* (January 1, 1946), 581.

24. Department of the Air Force, "Special Order No. 130," July 2, 1948, 168, Box 2, Misc papers, Ritland papers.

25. *San Diego State College Aztec News Letter* no. 31, October 1, 1944, 3, San Diego State University Archives, https://digital.sdsu.edu/, accessed July 1, 2022.

26. Ritland biography, January 26, 1951, 128, Box 2, Misc. Papers, Ritland papers.

27. Ritland oral history, 82; and Montoya, interview.

28. The unit was called the 48th Air Depot Group until March 1, 1945, when a bureaucratic reorganization took place, combining the 48th ADG and Assam Air Depot into one unit under Ritland's command. End strength numbers above are for March 1945. (See Capt Saul A. Sheriff, "History of the Assam Air Depot [for March 1945]," AFHRA, Reel A8282, 78.)

29. Ritland oral history, 83–86; and Memo, Ritland to Commanding General, United States Forces, India-Burma Theater, Subj: Application for Command and General Staff School, January 3, 1946, Ritland papers; and China-Burma-India: Remembering the Forgotten Theater of World War II, "CBI Order of Battle."

30. Rudolph F. Gaum, "Experiences with the A T C and Military Activating in China, Burma, India (C B I) The Forgotten Theater of Operations in World War II," unpublished manuscript, revised 2nd edition June 2005 (Rockville, MD, Public Library), 70.

31. Sgt John McDowell, "Assam Coal Produce Aids U.S. Army," *India-Burma Roundup* 3:45 (July 12, 1945), http://www.cbi-theater.com/, accessed June 10, 2022.

32. Arnold diary, 449.

33. Arnold, *Global Mission*, 418.

34. LeMay with Kantor, *Mission with LeMay*, 322, quoted in Richard Rhodes, *The Making of the Atomic Bomb* (Simon and Schuster, 1986), 586.

35. McKeown, quoted in John D. Plating, *The Hump: America's Strategy for Keeping China in World War II* (Texas A&M University Press, 2011), 44–49.

36. Olver La Farge, *The Eagle in the Egg* (Houghton Mifflin, 1949), 112, 116.

37. Lt Gen J. W. Stillwell to Generalissimo Chiang Kai-Shek, memo, subj: "A report on Chinese-American progress to reopen land communications with China," March 13, 1944, 2, NARA, RG 493, Box 656, Folder 4.

38. Brig Gen Richard A. Knobloch, oral history interview, 14 July 1987, with James C. Hasdorff, 53–55, AFHRA, IRIS: 01105329. As a lieutenant, Knobloch flew over 50 missions from Assam against Japanese targets in Burma.

39. Tunner, *Over the Hump*, 55; and "Lieutenant General William H. Tunner," official biography (n.d.), https://www.af.mil/, accessed September 7, 2022.

40. William H. Tunner, *Over the Hump* (Office of Air Force History, new imprint, 1985), 43.

41. Tunner, *Over the Hump*, 44–47.

42. Tunner, *Over the Hump*, 45–46; and La Farge, *The Eagle in the Egg*, 201.

43. La Farge, *The Eagle in the Egg*, 201–2. The languages on what airmen called a "blood chit" were "Chinese, Burmese, South Shan, West Shan, and Sgaw Karen," according to La Farge.

44. Henry Fountain, "Dr. Donald [Don] D. Flickinger, 89, A Pioneer in Space Medicine," *The New York Times* (March 9, 1997), Gale in Context via

Ebscohost, accessed August 19, 2022; and La Farge, *The Eagle in the Egg*, 202–3.

45. Tunner, *Over the Hump*, 47–49.

46. Tunner, *Over the Hump*, 49–50.

47. Tunner, *Over the Hump*, 43.

48. Ritland oral history, 84–85.

49. "Total Time as of Feb [19]29 [to] Feb [19]52," Ritland papers.

50. Memorandum for Commanding Officer, Northern ASAC [Air Service Area Command], Subj: "Battle Participation Credit," July 6, 1945, Ritland papers; and Headquarters Northern Air Service Area Command, General Order No. 20, "Award of the Bronze Star [on the Asiatic-Pacific Theater Ribbon]," July 20, 1945, AFHRA, Reel A8282, 27.

51. La Farge, *The Eagle in the Egg*, 112.

52. Staff writers, "Hump Fliers Carry 776,532 Tons in Three Years; 594 Craft Lost," *India-Burma Theater Roundup* 4:11 (November 22, 1945), http://www.cbi-theater.com/, accessed June 10, 2022.

53. Frank H. Heck, "Airline to China," chapter 5 in *The Army Air Forces in World War II*, ed. Wesley Frank Craven and James Lea Cate, vol, 7, *Services Around the World* (USGPO reprint, 1983), 141.

54. "Hump Fliers Carry 776,532 Tons."

55. Tunner, *Over the Hump*, 129.

56. Gaum, "Experiences with the A T C," 120–23.

57. Ritland oral history, 83.

58. 1st Lt Raymond W. Eick, 886th Signal Company Depot Aviation, Assam Air Depot, Historical Report (July 2, 1945), AFHRA, Reel A8282, frame 257.

59. Army Air Forces History, 2 September 1945 to 31 December 1945, 4–5, NARA, RG 493, Box 650, Folder "Army Air Forces History."

60. Assam Air Depot, History, 1 July 1945, 1, AFHRA, IRIS: 00268054.

61. Capt Harold H. Fish, "Historical Report for the Month of April 1945," 48th Air Depot Group, c. May 15, 1945, AFHRA, Reel A8282, frame 178.

62. Army Air Forces History, 2 September 1945 to 31 December 1945, 10-11, NARA, RG 493, Box 650, Folder "Army Air Forces History."

63. "ASC [Air Service Command] Constructs Giant Storage Plane in Assam," *India-Burma Theater Roundup* 3:31 (April 12, 1945), http://www.cbi-theater.com/, accessed June 10, 2022.

64. Assam Air Depot, History, 1 August 1945, 1, AFHRA, IRIS: 00268055.

65. Heck, "Airline to China," 150.

66. Army Air Forces History, 2 September 1945 to 31 December 1945, 10, NARA, RG 493, Box 650, Folder "Army Air Forces History."

67. Ritland oral history, 86.

68. Sgt Ed Alexander, "I-B Pilots Make Runs Minus Navigation Aids," *India-Burma Theater Roundup* 4:20 (January 24, 1946), http://www.cbi-theater.com/, accessed June 10, 2022.

69. Gaum, "Experiences with the A T C," 124–26. And the Nationalist Chinese Air Force thought enough of Ritland's efforts to make him an "Honorary Officer of the Chinese Air Force, and entitle[d] him to wear the [Chinese] Air Force Wings Insignia," though no photos show him ever wearing it. (Memo, Herbert I. C. Yuan, Major, CAF, Commanding officer, HQ Northern India Area Command, Subj: "Commendation to Unites States Officer Named Below [Ritland]," 5 November 1945. The reverse side is the authorization in Chinese. (Ritland papers)

70. Sgt Chet Holcomb, "Surplus Sale to Mean End of Mission in I-B," *India-Burma Theater Roundup* 4:25 (February 28, 1945), http://www.cbi-theater.com/, accessed June 10, 2022.
71. Army Air Forces History, 1 January 1946 to 30 April 1946, 1-4, NARA, RG 493, Box 650, Folder "Army Air Forces History."
72. Sgt Ed Alexander, "I-B Pilots Make Runs Minus Navigation Aids," *India-Burma Theater Roundup* 4:20 (January 24, 1946), http://www.cbi-theater.com/, accessed June 10, 2022.
73. Ritland oral history, 83.
74. Heck, "Airline to China," 151.
75. Ritland oral history, 83; Memo, Ritland to Commanding General, United States Forces, India-Burma Theater, Subj: Application for Command and General Staff School, January 3, 1946, 261, Box 2, Misc papers, Ritland papers; and John W. Partin, "Wars and New Challenges, 1939–1983," in John W. Partin, ed., *A Brief History of Fort Leavenworth 1827–1983* (Combat Studies Institute, 1983), 40–42.
76. Col Osmond J. Ritland, memo, no subj., February 18, 1946, 253, Box 2, Misc papers, Ritland papers.
77. David M. Brown to Brig Gen Ritland, memo, May 5, 1959; Ritland to Brown, memo, May 11, 1959, Ritland papers.
78. Montoya, interview, 32:50.
79. Michael David Stewart, "Raising a Pragmatic Army: Officer Education at the U.S. Army Command and General Staff College, 1946–1986," PhD diss. (University of Kansas, April 22, 2010), 13–15.
80. Stewart, "Raising a Pragmatic Army," 15n9.
81. Stewart, "Raising a Pragmatic Army," 15n9.
82. "Training Generals for the Next War," *Fort Leavenworth News*, September 29, 1945, 1; "Command Class Completes Training Course," *Fort Leavenworth News*, July 27, 1946, 3; and "Second Command Class Graduates July 31," *Fort Leavenworth News*, September 29, 1945, 1. Provided by US Army Command and General Staff Library Archives.
83. Stewart, "Raising a Pragmatic Army," 15; and Ritland oral history, 87–90.
84. Elizabeth Dubuisson, US Army Command and General Staff Library Archives, "Army PME Question," email to the author, July 6, 2021.
85. He still managed 50 flight hours in the previous six months. Source: flight physical, September 5, 1946, Ritland papers.

Chapter 5

Flying at the Start of the Cold War

Col Vincent T. Ford was an aide to the special assistant to the secretary of the Air Force for research and development, Trevor Gardner, and a friend of Ritland's going back to the 1930s during flight training in Texas. Ford travelled a lot with Gardner as Gardner tried to understand the state of Air Force R&D. Gen Jimmy Doolittle called Gardner a "sparkplug" who did "a tremendous job in expediting the development of the missile, in directing funds and brainpower into the missile program." Doolittle also described Gardner as "sharp, abrupt, irascible, cold, unpleasant, and a bastard," who "did not endear himself to senior Air Force officers."[1] On this particular trip to New Mexico, Gardner was not interested in missiles but nuclear weapons.

When they arrived at Kirtland AFB in Albuquerque on the afternoon of April 20, 1953, Ritland was on the ramp to meet the aircraft, alongside the new base commander Maj Gen John S. "Jack" Mills and some other senior people. The group proceeded to Mills's office for some briefings and then finished for the day. The next day was full of briefings from 8 a.m. until 4 p.m., when they finally finished and then went to dinner.[2] After the meal at the Officers Club, Gardner and Ford returned to their quarters for a few hours of sleep because the day was only half over.

Just before 11 p.m., Gardner and Ford showed up at an aircraft hangar for an operations briefing for an atomic test over Nevada, code named "Dixie."[3] In his memoir, Ford described the meeting as "Trev Gardner's first real exposure to Ritland," but it would not be their last. Ritland thought later that Gardner "was instrumental in my assignment to the U-2 and the ballistic missile programs because he was very instrumental in getting these major programs for the Air Force going, or for the country going—the Turkish radar, the U-2, [and] the ballistic missile program. He was very instrumental in that."[4]

Ford described Ritland as "a dedicated Air Force colonel of the old school." As commander of the 4925th Test Group (Atomic) Ritland ran the flight operations for the atomic test program at Nevada and in the Pacific. Ford called it "a big job. You had to know airplanes, atomic bombs and what you were doing. Ritland handled it all with a professional's quiet competence." The night Gardner and Ford visited, the briefing room was full but the flight crews, although appearing "relaxed," were "'up' and on their game." Ford remembered "the atmosphere in the briefing room this night was charged with the electricity of war," which was exactly what they were about to simulate.[5]

Fig. 7. Ritland stands by a plane bearing the shield for the 4925th Test Group (Atomic). [Ritland family photo]

At exactly 11 p.m., Ritland began the operations briefing, outlining the mission on a blackboard. "All eyes were on him as he talked," said Ford. "There was no other conversation." When Ritland finished, each group leader outlined for Ritland "exactly what he was supposed to do on the mission—when and where to the second." This was a multimillion dollar test mission that was going to drop a nuclear weapon inside the United States. Everything had to go right. "Here was a rare kind of leadership," Ford recalled. "It wasn't so much what Ozzie was saying. It was the way he was saying it—quiet, forceful, nothing left out, nothing left to chance. The smooth precision of the whole exercise. But mostly it was Ozzie." The whole thing was over in 30 minutes and the colonel dismissed the crews.[6] Ritland escorted Gardner and Ford to the aircraft they would be aboard to witness "the shot," then headed off to his own airplane, probably a huge Boeing B-36 Peacemaker, that with its 30-foot-tall tail and 230-foot wingspan made the $5.5 million beast the largest mass-produced piston-engine aircraft ever built.

Ford and Gardner boarded a Boeing KC-97 Stratofreighter. The crew cranked the engines and taxied, and less than an hour after the end of the briefing, Ford recalled, they lifted off into "the star-studded New Mexico sky," making a shallow turn to the left and heading for the Nevada test site. With their headsets on, they could hear the radio chatter among the aircrews as they headed north, and "the night sky seemed filled with airplanes, all heading in the same direction." They arrived at their orbit point as the sun began peeking over the horizon, a mere preview of coming attractions. The radio chatter now became "a short, terse exchange—mostly coded jargon." Gardner and Ford, in their borrowed cold weather flight gear, shivered in the freezing cold of the operational aircraft. Out the window they could see the blinking red and green lights of other aircraft.[7]

At H-hour, each aircraft was due at an exact point in space—a fixed altitude, a prearranged speed, and facing in a particular direction so that its instruments could catch the details of what would take less than an instant to happen. Some planes needed to be headed into the cloud within 20 minutes to take samples, then dart in and out to make sure they had everything they were supposed to get. On some "shots," the 4925th might also have had a few drone planes ready to head into the atomic cloud at H-hour plus two minutes. SAC, TAC, and Air Training Command (ATC) also often sent many planes on these live tests to give their aircrews a feel for what a real atomic blast felt like.[8]

Ford recalled what happened next.

> Suddenly beneath us, off to our left (it seemed five miles away but must have been farther), there came a blinding flash. The ground around it seemed to shudder from the shock and the sky and the earth for as far as one could see, and the interior of our aircraft was flooded with a brilliant white light. It was as if night had become day in a microsecond. (We had been told to glance quickly away from ground zero for a second or two.) And then a great doughnut-like cloud of boiling dust and flame immediately formed, hugging the ground. It encircled the area where the flash had been, rolling in on itself toward the center—an inferno of flame and smoke—and then spewing upward in a churning, massive fire-ball that rose swiftly in angry, demonic convolutions into the night sky. If ever there was a preview of hell, this was it.
>
> And then as you watched this awesome display, now rising above you, it began to flatten out at the top in terrifying grandeur, slowly shaping itself into a giant mushroom cloud. After about a minute or two of this the airplane suddenly rocked and jolted and then just as quickly steadied itself—the shock wave.[9]

Gardner and Ford looked at each other, Gardner raising his eyebrows for a second and then turning back to the window. Recalled an observer of another test, “There in Nevada . . . man had not only flown close to the sun—he had created the sun, at a time and place of his own choosing.” In an earlier test, Capt Jerome Blanchard told a reporter that he did not wear the special protective goggles during an April 1952 test and “the flash blinded him for a short period” while the copilot, who did wear goggles, was flying a B-50 bomber. A second shock wave may have hit Gardner’s plane, a reflection back from the mountains around the test site. The sky would have “remained red for a full two minutes.” The sample planes went where the winds took the cloud as it rose higher and higher, maybe to the Utah border as the dissipating radioactive cloud headed toward Salt Lake City.[10]

With the first blasts of atomic weapons on US soil since 1945 came warnings of the tests that people for hundreds of miles around Nevada could catch a glimpse of. Explosions in February 1951 "lit up a half million square miles in four western states, [and] could be seen in Arizona, Utah and even in San Francisco, 400 miles off." *LIFE* magazine photographer J. R. Eyerman took photos for the journal. "The next day he shot the sun with the same exposure, [and] found the A-bomb many times brighter."[11]

Under his command, Ritland's aircrews conducted 16 nuclear tests of weapons up to 70 kilotons in yield to test the ballistics of the bombs and the capabilities of the aircraft.[12] But before he took over this test organization, he had some more R&D work to do. From this point on in Ritland's career, the problems began to come faster and grow more complicated, requiring both his technical skills and his leadership.

In the summer of 1946 after the Command Course, when the Ritland family returned to Ohio, there was still test work going on in the aircraft section. The military continued to seek out airplanes that could go higher, farther, and faster than any before. In June, Lt Henry Johnson set a world speed record of 426.97 mph in a P-80 on the same day pilot Capt James Little flew a B-29 from Dayton to St. Louis at an average speed of 361 mph. Two months later, Sgt Lawrence Lambert was the first American to eject from a Northrop P-61 Black Widow at 302 mph and 7,800 feet. And that December at Kirtland Field, Air Materiel Command began supporting the Manhattan District of the Army Corps of Engineers in atomic bomb testing.[13] Maj Gen Laurence C. Craigie, the chief of the Air Technical Service's Engineering Division, assigned Ritland to the "aircraft project section" in 1946. Craigie, who had been the first pilot to fly the XP-59A jet at Muroc in 1942, had served as chief of the aircraft projects branch from March 1941 to March 1943.[14]

Ritland began duty as the "deputy chief of the aircraft project section, responsible for the purchase of all new Air Force experimental aircraft. Serving in that section for a year and a half, he then transferred to the aircraft laboratory, concerned primarily with the testing of frames and component parts. Again, after another year and a half, he was assigned to the Air Materiel Command's Engineering Division Operations, which included technical supervision of the power, propellor, aircraft, materials, and aero medical activities."[15] He described the aircraft laboratory as "a design group that theoretically designed new concepts [and] new airplanes," a much more theoretical role than the developmental testing he did during the war.[16] The lab divided the work into two areas, experimental aircraft and experimental missiles. Ritland first briefly worked in the bombardment branch before moving over to work on experimental aircraft. In those days, Ritland said they were working on air-to-air missiles, not ICBMs, but the people working there did eventually form the core of the ICBM development programs.[17]

Unfortunately for people interested in new and different things, new concept development was stunted because there were still a lot of airplanes on the books from the war and budget pressures lengthened development schedules back to their prewar pace. This was the period when new jets like the B-45, B-46, B-47, and B-48 were all experimental and the B-36, B-49, B-50, B-51, and B-52 were all being developed. When Ritland joined the branch, the B-52 "was a great big, old six-engine turbo-propeller-driven airplane, a big dog," well before the B-52 received its eight jet engines. And with no international tensions pushing the development of new types of aircraft, few advancements occurred during this "doldrum period." But, he recalled, "I felt real good to get into the experimental aircraft business because I had flown all these things, and I was back in the old fold again."[18]

Ritland used the time to further his interest in aircraft propulsion and reliability. For example, he served on the National Advisory Committee for Aeronautics' aerodynamics committee, which was led by Dr. Hugh Dryden and Maj Gen Donald Putt, reviewing the development of the wind tunnel facility in Tullahoma, Tennessee, at what today is called Arnold Air Force Base.[19] The power plant laboratory at Wright Field had "25 units, each specializing in the various components of an aircraft engine, such as ignition, carburetion, cooling systems, etc., and enormous dynamometer and torque stands."[20] It was also the period of the transition from turbo-charged propeller-driven planes to jet engines, and there was some debate at Wright Field about sticking with the old technology or pressing ahead with the new. Although turboprops gave more range, jet engines gave more altitude, performance, and speed. The jet engine proponents eventually won. The XB-51 and XB-52 received new engines in their designs, and the US military moved into the jet age.[21]

At the new Wright-Patterson Air Force Base (created when Wright Field and Patterson Field merged in 1947 as the United States Air Force was created), one of the major developmental programs Ritland worked on was the ejection seat. The Luftwaffe had one during the war, and the British already had one, too. Brig Gen Fred Dent called Ritland in and charged him with "getting an ejection seat going right quick." Ritland's team was an accomplished one. The director of research at the School of Aviation Medicine at Wright-Patterson was Air Force doctor Don D. Flickinger, the same one who used to jump into the jungles of Burma to rescue downed pilots and later helped put the Mercury astronaut candidates through their paces at the Lovelace Clinic in New Mexico. Flickinger's contribution to Ritland's team, though, was to include in the ejection system "a small supply of oxygen for the initial descent and a barometric release mechanism to ensure that the parachute did not open until later, in air that was thick enough to breathe." The goal, according to Robert Hotz, former editor of *Aviation Week and Space Technology* who was interviewed for Flickinger's obituary, "'was so that you could bail out without dying on the way down.' "[22]

The US Navy had done some testing of an ejection seat using a propellor-driven Northrop P-61 Black Widow night fighter, but nothing had been developed for the high speeds and altitudes of the jet age. Ritland called a team together and told them they had the funds and the authority to put an ejection seat in a Lockheed P-80 Shooting Star, working "with the equipment laboratory, aeromedical laboratory, aircraft laboratory, [para]chutes and equipment laboratory" to create the capability. The aeromedical lab was concerned with the pilot in the cockpit; the aircraft lab dealt with the mechanical operation of the system; and the armament laboratory worked on the propulsion, that is, the device that would actually eject the pilot out of the aircraft. They started with some fundamental questions: Could a jet pilot slow down enough in crisis to bail out of an airplane? Would the pilot get trapped in the air pressure over the cockpit when he tried to bail out? Could an ejection seat keep a pilot from ejecting and then hitting the plane's tail? What happens as speeds increase? (Remember, Chuck Yeager broke the sound barrier in 1947.)[23]

They were ordered to have five successful ejections with dummies before they could put a human in a seat. Some tests with dummies went well, others did not as some tests hung up on the aircraft and others tumbled after ejection. They kept working on the problem. The medical team would not agree to sign off on further testing, arguing that a pilot could not survive the g forces or spinning or tumbling should the parachute fail. Finally, Ritland went to Maj Gen Franklin Carroll, who gave his approval for human testing. Carroll was worried because he had previously approved a parachute test from 40,000 feet, which had resulted in a death.[24] But, the general finally said, "I just can't stop progress," and authorized the human testing of the ejection seat.[25]

Capt Vincent Mazza was the test subject in 1949. Ritland rode behind Mazza in a two-seat P-80 up to about 10,000 feet and Mach 0.8 over San Francisco Bay. Recalled Ritland, when the ejection happened, "old Mazza popped out of there. That seat spun like a pinwheel, and the parachute opened. It looked like he stretched four times his body length and I wrote him off. We pulled around, and there he was, waving in his parachute." Ritland recalled Mazza as "a tiny, little wiry guy, and man alive, it made you feel kind of funny to strap the guy into the back end of the P-80 and pat him on the head and say 'I'll see you in ten minutes'. . . [and then] you'd see him ten minutes later and he was just in A-number-one shape, and he'd say, 'Let's do it again tomorrow.'"[26]

Ritland recalled only one of the five test jumps being completely effective but declared the project "totally and completely successful. Nobody was hurt. All of the negative information that everybody was concerned about happened, and it didn't bother anybody." But they learned from their mistakes and the "negative information" and created a useful system to save lives.

Then came the campaign to convince aircraft manufacturers and pilots that ejection seats really were a necessity. About the same time, the crash of a North American AJ-2 Savage patrol bomber off the West Coast seemed in Ritland's mind to get people to acknowledge that with ejection seats, the crew might have survived. The need for a different way to get out of high-speed aircraft had become apparent, "and within no time at all, in accidents, people were beginning to save their lives" with ejection seats.[27]

Technological changes were also happening to weapons that those aircraft were supposed to deliver in wartime. When B-29s *Enola Gay* and *Bocks Car* dropped atomic bombs on Japan in August 1945, the system the USAAF had developed to drop nuclear weapons was still essentially a test operation. The B-29s were highly modified to hold the experimental atomic bombs just out of the laboratory and the crews were specially trained for the mission. But after the war, it became obvious that the United States was going to have to rely on nuclear weapons for deterrence. It also became obvious that the nation needed a new organization to operationalize the test systems that had been built. The creation of Strategic Air Command was part of this drive to operationalize nuclear weapons in the deterrent posture of the United States. But there was more to it than that. Airplanes and bombs had to be made compatible on a scale much larger than the two deployed at the end of World War II. The problems were aerodynamic and tactical: adapting bombing techniques and systems to the current bombs and developing new tactics, techniques, and procedures for the next generation of bombs and bombers about to enter the inventory.[28]

The first airdrop tests came after SAC held a competition to select the best crew to drop a weapon for Operation Crossroads, but these tests were still basically developmental test flights, intended to evaluate the effects of nuclear weapons, not their delivery systems.[29] When the Soviets detonated their first nuclear device in 1949, a new urgency arrived at SAC headquarters for Gen Curtis LeMay to ready his combat command for World War III.[30]

Although the Atomic Energy Commission (AEC) had responsibility for building nuclear weapons, the Air Force had responsibility for their delivery by airplane. By 1950 it had become "readily apparent," in Ritland's words, that the service needed a test organization to ensure the B-36s, B-47s, B-50s, and eventually B-52s could carry the weapons into combat. The B-36, for example, first delivered to SAC in 1948, had not been designed during World War II as a nuclear-capable bomber and needed to be retrofitted.[31] This new test organization needed to develop ways to determine the ballistics of the various weapons and the procedures necessary to load and unload various aircraft with the bombs. Ritland described the group's mission much more clearly: "fly missions and drop these different weapon devices."[32]

In February 1950, Ritland left Ohio to stand up the 4925th Special Weapons Group, later the 4925th Test Group (Atomic), which he commanded at Kirtland AFB. This group was responsible for development and testing of all equipment needed to attain the Air Force's nuclear weapons capability. "When they dropped the bomb on Hiroshima, only a few planes had been modified for such a mission," Ritland said. "They eventually decided that they wanted as many Air Force planes as possible modified to drop atomic weapons; so the job I had was to test the airplanes that were modified to carry nuclear devices and to get the ballistics on the bomb."[33]

Ritland said later he was not quite sure why he got the command. Maj Gen Howard Bunker, whom Ritland had "known for many years at Wright Field, had been assigned to the new job of the Special Weapons Command, which was established for the purpose of attaining an atomic bomb delivery capability in our bomber aircraft. Simply stated, that was it."[34] Bunker had been chief of flight research in Ohio for a year during the war until deploying to Europe in February 1943, where he served as chief of the Air Technical Section, and then after returning home in February 1945, he became chief of the Aircraft Project Branch at the Pentagon, staying in the R&D field. In December 1949, Bunker, who had been commander at Kirtland AFB since April 1947, became the commander of the Special Weapons Command there.[35] Before the Air Force established Bunker's new command in Albuquerque because of its proximity to nuclear hardware and component manufacturers, the responsibility for getting the bombers ready to fly atomic weapons rested with the aircraft projects section at Wright Field, where Ritland was the deputy. The test organization developed and proved the aviation technology, tactics, techniques, and procedures while the shapes of the bombs were changing, the yields were changing, and the technology was changing so quickly. Having the scientists and the flight testers at the same location was probably more efficient.

Although Air Force command positions are vetted through several levels and one can certainly understand why the 4925th Test Group (Atomic) would get some scrutiny, someone like Bunker knew Ritland, thought highly of him, and selected him to lead the new organization, with the Air Force's eventual approval. Ritland's task was to get the Air Force, the Atomic Energy Commission, and the Sandia Corporation to work together to provide a capability to get the ballistic features of the various weapons "and secondly, to demonstrate the feasibility of loading, unloading, and demonstrating the compatibility of these weapons with the various aircraft."[36] Maj Gen John Mills, who succeeded Bunker in October 1950, said the mission of the center was to test "special weapons in the field of Air Force interest and responsibility" and help the "Atomic Energy Commission in the development and testing of experimental nuclear devices." The group also conducted "specialized flight and ground tests for all agencies of the Air Force, the Department of Defense, and civilian research and development organizations connected with the atomic program."[37]

To accomplish this mission, Ritland gathered the "best bomber and fighter pilots in the USAF and all types of expert support personnel" at a small compound on Kirtland, according to a history of the unit called *The Megaton Blasters*.[38] They came from locations around the world, and their inventory of aircraft as of December 31, 1950, included four B-29s, four B-50s, two B-45s, one C-47, one H-5, one H-19, and two L-13s, plus attached B-36s from SAC. With 51 officers, 343 enlisted personnel, and three civilians to support USAF missions at Kirtland, the group saw its workload double during the summer of 1950. The projects they had included building two new hangars, two new laboratory buildings, one project engineering building, and a new administration building. Ritland improved the efficiency of the work by implementing a staff system. The S-1 handled personnel, S-3 handled aircraft operations, S-4 handled logistics, and S-5 did project planning. Wrote the unit historian in the 1950 official history, "From humble beginnings has arisen a highly technical group of people to form an important organization to aid the armed forces in the development of its special weapons."[39]

According to Maj John Hardison, author of the 1990 book *The Megaton Blasters*, "All aircraft then in the Air Force inventory and thought capable of nuclear weapons delivery were to be obtained and sent to the 4925th for testing. The Special Weapons Command, a major USAF Command reporting only to the Pentagon and the AEC, set the wheels in motion to expedite this." The mission of the 4925th was to

- "Marry" all nuclear weapon types to all suitable types of aircraft.
- Establish the ballistics of each type of nuclear weapon, on precision bomb ranges.
- Support the AEC with live test drops, at Nevada and the Pacific.
- Fly through and "sample" the highly radioactive nuclear "clouds" after the bangs.[40]

Soon more bomber, fighter, and helicopter pilots began arriving. So-called triple-rated bombardiers arrived, qualified as bombardier, navigator, and radar operators. These "highly-qualified officers and airmen especially trained for this type of work" were helped "on the ground by professional engineers, skilled electronic technicians, and maintenance personnel."[41] Staff officers, nuclear project engineers, both military and civilian, depot-level modification experts, aerial camera operators, photo lab technicians, bomb loading specialists, airplane crew chiefs, and aircrew all began to arrive, too. Said Hardison, "If there ever was an ELITE outfit, the 4925th was it. . . . Col Ritland 'welded' these pros into a highly sharp TEAM."[42]

They felt the same way about him. In a letter to Maj S. R. Kalmus, Col W. J. Watkins wrote, "In all seriousness, I will state without fear of contradiction that Col. Ritland had the absolute respect and loyalty of every person in that big group—officers, airmen, and civilians. As I look back over nearly 30 years, I can honestly say that I have never served with a man who better demonstrated the quality of leadership. . . . I think it's generally conceded that the group accomplished its mission in an outstanding manner and I think the credit must go to that demonstrated leadership. He always practiced what he preached, whether it was maintaining a decent place to live for the airmen in the barracks or flying some of the first article aircraft we got to marry with the various weapons."[43] Ritland's men appreciated his leadership and his technical ability, impressed by his ability to "grease" a Republic F-84 Thunderjet fighter-bomber onto "a runway as [well] as any pilot in the business."[44]

While most of the details surrounding the tests remain secret, it was pretty hard to hide bombers flying over the Nevada Test Site and even harder to hide atomic blasts and the resulting blinding flashes and mushroom clouds. The Kirtland AFB newspaper, the *Atomic Flyer*, was among the first to confirm the mission of Ritland's test group. "In a surprise move that pulled aside at least a portion of the heavy veil of secrecy enshrouding the Nation's atomic weapons testing program, the Defense Department-Atomic Energy Commission Joint Information Office made available to The FLYER this week the first photographs . . . to show Kirtland's participation in the atomic tests being conducted in Nevada." In a prepared statement, a government official said, "The mission of the 4925th Test Group (Atomic) commanded by Col. Osmond J. Ritland 'is to provide aircraft and crews for each airdrop of a nuclear device.' The 4925th provides aircraft for radiological detection, cloud sampling, cloud tracking, aircraft decontamination, 'and a total of some 45 specialized aircraft demanding optimum skill in positioning in space and extraordinary coordination of effort to achieve the maximum benefit from the tests.'"[45] Ritland put it a little more simply: The "mission of that outfit was to fly missions and drop these different weapon devices, and we started with every one of them, the Mark 4, Mark 6, Mark 5, Mark 7, Mark 11, all the early versions of bombs."[46]

They started with the best B-29s they could find and a few B-50s (a "Cadillac version of [the] B-29"). They soon added a B-36H, B-45, B-47, B-57, B-66, and a B-52C. They also started with a few "beat-up F-84s and F-86s" but then added four of the first F-84Fs off the line, a F-86E, F-101A, F-104, and F-105. They also had helicopters: "Three beat-up YH-19s and two new YH-21s. Weird birds, flown by weird pilots, on weird tests," Hardison recalled about his peers.[47] The group did things like strip down a T-33 so it could reach the altitude and speed needed to record the 40,000-foot drop tests. Then they put a camera operator in the back seat with a hand-held movie camera. "At release, the T-bird went into a screeching dive, doing a continuous roll around the bomb, with the cameraman shooting through the top of the canopy. The pull-out was made at the last second. The new G-suits came in handy. About half the time, two chase planes were required. This required all of the above, plus maintaining separation between the rolling aircraft and, of course, the bomb."[48] Although the sizes of the tests at Nevada were limited, Hardison wrote, "ALL drops resulted in two moderate-to-severe 'bumps' as the primary shock wave hit the aircraft and then the ground-surface-reflected shock wave" hit the aircraft.[49] It was Ritland's policy "to spread actual drop assignments among as many different crews as possible."[50]

Their mission had taken on a new urgency with the June 1950 communist invasion of South Korea. With his resolve strengthened, President Harry Truman "decided that he had to notify the American public of the new test operations, and on January 11, 1951, the AEC released an official announcement." The first atmospheric test was to be January 27. "The announcement was short and to the point," wrote political scientist and Congresswoman Dina Titus, "explaining simply that test activities at the new site would include 'experimental nuclear detonation for the development of atomic bombs—so-called "A-bombs"—carried out under controlled conditions.'" The Soviet test of "Joe One," its first atomic blast in 1949, and the urgency of the Korean invasion in June 1950 had spurred the United States to think about reducing costs and speeding up the production of the nuclear stockpile, especially of low-yield weapons. According to author Titus, "Despite warnings from the scientific community about safety hazards, President Truman, on December 18, 1950, approved the establishment of such a facility [i.e. a nuclear test site in the CONUS] in southern Nevada and six weeks later, on January 27, 1951, the first atomic weapon was tested over a section of the desert known as Frenchman Flat."[51] The first series of tests at the Nevada Proving Ground [NPG] was code-named "Operation Ranger," consisting of five nuclear detonations between January 27 and February 6, 1951. "The primary objective of this operation was 'to provide sufficient data to determine satisfactory design criteria for nuclear devices' scheduled to be detonated in the South Pacific later that spring. Toward that end, five devices, ranging from one kiloton to twenty-two kilotons, were airdropped over Frenchman Flat, a dry lakebed in the southwestern corner of the proving grounds. Four were detonated at a height of 19,700 feet above the ground, and one at 29,700 feet."[52]

The NPG test site had been chosen because it was isolated from much of the US population (although not all) and the weather was good (low rainfall and predictable winds). Geology was not a factor in the initial site selections because underground testing was not planned.[53] Part of a 350-square-mile World War II aerial gunnery range, the site was 65 miles northwest of Las Vegas. Nearby, Indian Springs AFB could be used to support testing.[54] The area eventually became the "valley where the giant mushrooms grow," according to a US government film about the test program. More atomic bombs were exploded "on these few hundred square miles of desert than on any other spot on the globe."[55]

First, using dummy cases with the same center of gravity and weight as a real bomb, they gathered data and developed bombing tables by flying over the Salton Sea, a lake in Southern California, where they flew aircraft at altitudes similar to the planned mission altitudes. They started with all the early versions of the bombs, demonstrating that they fit in not only Air Force planes but Navy aircraft as well. About 50 aircraft in all had to be fitted for early versions of atomic bombs. Then they moved on to "practical demonstrations" because the AEC wanted some testing of air-dropped weapons.[56] Ritland's team worked out the details, made up an operations plan, and presented it to the AEC, which accepted the risk of dropping nuclear weapons in the Nevada desert. In addition to their own aircraft needed for the tests, the 4925th also had operational control during the tests of "all other participating aircraft of other Air Force Commands and the Navy."[57] They dropped five weapons in five days from 15,000 to 20,000 feet, Ritland recalled in interviews, "within seconds of the pre-determined time and detonated substantially under 200-feet from a pin-point target—phenomenal accuracy considering a release from approximately six miles above the earth."[58]

Like many tests at the time, an announcement of the test Ford and Gardner had observed had probably been made in the local newspapers. Journalists and photographers could witness the testing from a hill, dubbed "News Nob," that was just 10 miles from ground zero. One reporter remembered a test this way:

> You put on the dark goggles, turn your head, and wait for the signal. Now—the bomb has been dropped. You wait the

> prescribed time, then turn your head and look. A fantastically bright cloud is climbing upward like a huge umbrella. . . . You brace yourself against the shock wave that follows an atomic explosion. A heat wave comes first, then the shock, strong enough to knock an unprepared man down. Then, after what seems like hours, the man-made sunburst fades away.[59]

Someone entering a casino in Las Vegas might have heard the roar of a B-36 or other airplane overhead and looked up. But over "the clatter of dishes, and the click of dice on the crap tables" while chatting with friends, one might not have heard or seen anything.[60]

The test program became a tourist draw for Las Vegas, though. The Chamber of Commerce printed calendars with likely detonation dates and times and the best spots for watching the blasts. At the Binion Horseshoe or Desert Inn casinos you could drink "atomic cocktails" until dawn and then watch the sky light up. Dressed as mushroom clouds, women competed for the title of "Miss Atomic Energy."[61] The Nevada Department of Highways even used its travel magazine to describe what visitors to the region might see, devoting over 10 pages of its June-December 1953 issue to the topic in an article called "Operation 'Doom Town.' "

> As the first faint streaks of dawn poked over the distant hills the blast came. A vivid flash of light pierced the desert darkness and lighted up the entire countryside. It lasted but a moment or two then was gone. All eyes then turned toward the spot where the bomb had exploded. They saw a big ball of furiously churning fire, smoke, sand and debris rising rapidly from the ground in huge, rolling waves. The afterglow remained for several minutes while the mushrooming cloud continued to rise then drift away and apart. The sun was still below the horizon but daylight was coming fast. Broad streaks of sunlight slanted over the mountain tops like ghostly fingers clawing at the heavens. Rumbling of the shock wave continued for nearly five minutes, bouncing back and forth from one mountain wall to another.[62]

In fact, the A-bomb blasts also spurred their own kind of brief mini-culture in Nevada. Today, there is a whole museum in Las

Vegas dedicated to atomic bomb testing called the National Atomic Testing Museum.[63]

Flight operations on the day of a test were extremely complicated, involving 50 to 100 airplanes coming from all over the United States to a specific location at a planned time, requiring precise communications with all kinds of callsigns and commands and air sampling without the automated control of today's systems—but all done without a single accident.[64] They achieved accuracy in the drop by a timing sequence in which "instruments [were] used to gauge the B-50's arrival over the bomb release line at a predetermined moment," also using visual and radar checks, according to a contemporary newspaper article. The pilots and flight engineer, in control of the airplane, monitored speed, drift, and altitude during the final run.[65] Responsible for 16 tests, Ritland went along with the crews when they dropped a live bomb.[66] He was "actively engaged in developing the use of A-bombs for almost every type of plane the Air Force" flew, a reporter noted, including "jet fighter-bomber aircraft."[67]

According to a local reporter, "The group had built the latest developments in nuclear weapons into what the Air Force calls 'atomic capability' for at least five aircraft—the B-36 and B-50 propeller-driven bombers; the B-47 and B-45 jet bombers; and the F-84 'Thunderjet' fighter-bomber." His test group, known for its high morale, had become one of the tightest units in the Air Force. By now it was six times larger than when he stood it up in February 1950. They had delivered against weather, mechanical error, and human error and coordinated as many as 110 planes up to eight miles high and flying at 400 mph, placing nuclear weapons "on the bullseye" within a second or two, and ensuring the enormous expense for each test was not wasted.[68]

One officer who flew with Ritland remembered evidence of Ritland's direct leadership before one of the Nevada tests. "At about 2 o'clock in the morning, a group of us were on a B-50 wing and the maintenance men were just finishing their work. The ladder started wiggling and it startled us all to see the boss peer up over a wing—he was simply checking to see what was going on in the hangar at that hour of the day. As I recall, we had some coffee, shot the breeze for a little while, and then went home for a few hours [of] sleep."[69] Said Ritland later, "I don't feel I'm doing my job unless I know the problems of my men."[70]

But despite what you might expect for a mission as serious as dropping nuclear bombs on Nevada, Ritland was largely on his own in developing the test plans. "No one ever reviewed anything that I was doing, ever. . . . The night before a drop, the people would meet at Kirtland and I would brief them on what they were going to see, but not for their approval. They were visitors for observation purposes only. It didn't worry me at the time; it doesn't worry me now. But it's interesting to think that the responsibility was vested in me and accepted."[71] Ritland recalled Gardner's visit and him wanting to observe a test. In the operations briefing, Ritland had 50 pilots present for the mission the next day, and Gardner got such "a big bang out of that [he] wanted to ride on the drop airplane." Ritland would not let him fly on the airplane carrying a nuclear bomb but was pleased Gardner had been there to see the effort that went into mission planning.[72]

The 4925th often had high-level visitors, including Air Force Vice Chief of Staff Gen Nathan Twining.[73] On one flight they took nuclear scientist Edward Teller up with them because he wanted to see the results of his test firsthand. After reviewing procedures for oxygen and parachute, five crewmembers crammed Teller into the nose of a B-50 for the journey up to 20,000 feet while Ritland sat behind the pilot and copilot.[74] On another night, the weather was so bad that they eventually aborted the drop, even though 300 congressmen were waiting to witness the test.[75] Ritland did not always have the aircraft he needed, either, forcing him to borrow a B-36 and a crew, for example, from Strategic Air Command. He got the crew pressure suits and told them to fly it up to 50,000 feet, an unheard-of altitude for a B-36. When SAC told Ritland he could not take their airplanes above 45,000 feet, he replied, "Well, we're an R&D command; we extend the capabilities of these aircraft." By providing pressure suits for the aircrew, they "kept on flying."[76] Their efforts did not go unnoticed, either. Following 1952's Operation Tumbler, for example, the manager of AEC operations in Albuquerque sent General Mills his thanks for Ritland's "enthusiastic cooperation and fine professional ability [that] were thoroughly demonstrated at all times. The superior planning and supervision of the air operations contributed largely to the success of the whole operation."[77]

By 1952, the job had "become very routine among his men," according to one newspaper article that attributed to Ritland a "confident nonchalance with which the Air Force drops live A-bombs" on Nevada, although it is very unlikely the phrase referred to any indifference or lack of concern for a mission he and his crews took very seriously.[78] According to one newspaper article, for example, "Capt. George L. Trimble, Jr., of Adairsville, Ga., the bombardier, said he was not 'particularly' nervous when the bomb dropped, although the success of the test depended on his accuracy, [because] he was too preoccupied to be nervous."[79] Yet that particular test, the twelfth Ritland's team executed, was dropped within 3.5 miles of thousands of American soldiers crouched in foxholes for the explosion that people living in Las Vegas saw as a "fleecy white atomic cloud" drifting towards the city.[80] *LIFE* magazine caught a similar moment:

> Goggle-eyed GIs last week got their first glimpse of a weapon which someday may be used to support them, and perhaps against them—the tactical A-bomb (*LIFE*, Sept. 24). For weeks they had attended briefings at a camp near the AEC's Nevada Proving Grounds to learn how the bomb worked and the ways of withstanding it. From afar they had seen the flashes, felt the shocks and observed the clouds of other bombs the AEC was busily testing. As their day approached, they watched preparations at Frenchman Flat where their own bomb would go off. Animals were tethered at varying distances from ground zero, and film was placed in foxholes to measure the radiation which penetrated them. In Thursday morning's predawn blackness the GIs assembled. Shortly after dawn a red-tailed B-29 droned overhead. Loudspeakers rasped "Bomb away," and a dead and apprehensive silence blanketed the 5,000 spectators. Thirty seconds later and seven miles away the bomb went off . . . . Within the hour the GIs were milling around the area to see what damage was done. The answer was plenty, but it was principally to exposed targets. One GI concluded, "The foxhole is still the foot soldier's best friend."[81]

For his efforts, Lt Col George Stump, commanding officer of the 867th Field Artillery Battalion, inducted Ritland into the "Military Order of Atomic Redlegs," granting him the authority to "smile archly during any discussion of artillery fire power; . . . insist on deeper foxholes; . . . [and] go forth and radiate wisdom." The order's tagline: "Never have so few, with so much to talk about, been able to say so little."[82]

Years later, though, Ritland did have plenty to say about the nuclear test program. "We dropped 16 nuclear devices in a three-year period, and we had very little supervision," Ritland said. "My boss would just tell me to go and do it; so I did, but no one really had to give him approval. Some of these tests required that 100 planes be in the area, and they were my responsibility. These bombs were pretty big; for example, the one that was dropped on Hiroshima was about 18 to 20 kilotons. The last one we tested was about 70 kilotons, although that is small compared to what we have today."[83] Ritland told his family, "I never missed my target."[84] Most of Ritland's crews, "totaling many hundreds of men, [were] sent to Strategic Air Command where they add[ed] their experience to the ready force maintained by SAC."[85] Recalled President Truman in his memoirs, describing the importance of the testing Ritland helped lead, "By 1953 the nation had a stockpile of atomic bombs, together with the means for delivering these bombs to the target."[86] SAC crews often participated in testing "for psychological effect studies." Ritland used this term to a reporter "to indicate that the SAC men were in a similar role to Camp Desert Rock troops who witnessed the blast from foxholes," learning to deal with the effects displayed by actual nuclear blasts on their aircraft.[87]

Truman recalled hearing from an advisor that "the people of the United States will never stand for shooting off A-bombs in this country." He wanted to know if setting up the test site 70 miles north of Las Vegas would really speed up the nuclear weapons program and was told it would.[88] But as testing in Nevada became more controversial and as bomb yields increased, atmospheric testing eventually moved to the Pacific Ocean ranges before eventually moving underground and then stopping altogether. The damage had been done, though. In addition to the environmental impact of the above-ground testing that eventually led to the US-Soviet Nuclear Test Ban Treaty, as of 1985, unfortunately, 73 members of the 4925th had died, "most from radiation cancer. Many more [were] terminally ill, mostly from bone cancer," and more are undoubtedly gone today.[89] American law has recognized this group as eligible for benefits under the Radiation Exposure Compensation Act of 1990 as "Onsite Participants" in atmospheric nuclear weapons tests.[90]

Ritland, "the master of the atomic planes," flew his last mission aboard a B-36 on June 3, 1953, during the nuclear test appropriately known as "Climax," a 61-kiloton blast designed to gather data on the weapon in an airdrop, the largest blast of Ritland's tenure.[91] A reporter described it in the local newspaper as "the most powerful atomic bomb ever set off in the United States . . . lighting the western sky from Canada to Mexico and from the Golden Gate to Colorado." Observers in Los Barilles, Mexico, 1,150 miles south; Rifle, Colorado, 460 miles east; and Lethbridge, Alberta, Canada, 1,000 miles north, all reported seeing the flash. Said a reporter, "The tremendous fireball churned and boiled in a fiery mass for 40 seconds before it started to rise in the mushroom cloud. It could then be seen, still glowing and flaming, for another two minutes and 20 seconds as it rose in the zooming cloud, which rose swiftly to a height of 40,000 feet." The shock wave "rattled windows in Los Angeles and hit Modesto, Calif., with a rumble that one radio announcer said 'sounded like someone trying to break down the front door with a sledgehammer.' "[92]

But after three years in command, during which time the Ritlands loved living in New Mexico, it was time for an assignment change. Daughters Kathleen and Susan had attended local schools and were visible in the local community, participating, for example, in a "Juvenile Style" fashion show in 1952, which *The Albuquerque Tribune* featured in its pages. "I really hate to leave Albuquerque," Ritland told a local reporter, but they were headed to Washington, DC.[93]

The change of command ceremony for the 4925th was a tremendous affair, symbolizing the transfer of responsibility for the group from Ritland to Col Harry L. Donicht, a World War II veteran with a lot of combat experience and leadership in fighter aircraft.[94] There was a parade of bands, men in uniform, and aircraft overhead. Ritland was, in fact, "directed to report to the Parade Reviewing Stands" for the change of command ceremony and a parade "by order of 790 Airmen and 135 officers" in a letter signed by group adjutant Maj Edward Hurley. At the ceremony, Ritland was presented with the Legion of Merit medal, making him, in the words of one wag, "the only man decorated for an atomic bombing of the United States."[95] He earned the Legion of Merit for his "exceptionally meritorious conduct" as group commander. While exercising operational control of 102 aircraft from the Air Force, Army, and Navy, perfecting an operational technique to collect data vital for the nuclear weapons program. The citation praised him for "his outstanding leadership, mature judgement, [and] an ability to plan and execute" operations, reflecting "the highest credit upon himself and the United States Air Force." (He received the medal December 4, 1953, at his next assignment.)[96] A letter from Mills praised Ritland for molding his "personnel into a highly trained and equipped organization" by using "efficient management and [a] pleasing personality." Mills said it was "particularly gratifying to me, and of vital interest to the Atomic Energy Program," that Ritland's group's "accuracy record established by your personnel during the dropping of nuclear devices" was so high. Mills said he looked forward to working with Ritland again in the future.[97]

Afterward, Ritland and his family were treated to a personal tour of a B-47 bomber by the crew in blue flight suits, who even allowed the Ritland daughters to try on equipment like their flight helmets and then an informal dinner at the "Officers' Club for cocktails and h'ordvers [sic] and further activities."[98] Said one Kirtland officer, "He will have a lot of rooters out here," for his next assignments. "You couldn't find one in a thousand equal to him."[99]

Ritland, though, never forgot about the awesome power of nuclear weapons. Once you see a live test, he recalled, "you quickly get a different feel. You can't describe it. Furthermore, you ought to be in an airplane that drops one. Then you ought to be in an airplane that has one going off right underneath it, and these are little ones. Then all you have to do is multiply it by a million, and then you can understand what you're being involved with. It's horrible."[100] In the foreword to Hardison's book about the flight test organization, Ritland recalled the group he worked with: "Never in a peacetime (non-combat) operation have I seen such daily danger and risks to Air Force personnel . . . or such highly skilled and dedicated pilots, air crew, ground support Airmen and Civilians. My memories of these troops are proud ones indeed."[101]

But change is a way of life in the military, and the Air Force sent Ritland to what it considered a "routine" assignment, this time to attend the year-long, senior-level course in professional military education at the Industrial College of the Armed Forces in Washington. "We went through the regular course of industrial mobilization, organization of government, and we had these special exercises of political, worldwide, industrial preparedness problems, and you know, case studies of what would happen in case of an atomic attack, and we had teams of that nature. It was interesting; I enjoyed it. It was a year of relaxation and another example of interface of Army, Navy, and there we ran into civilian counterparts of the government, which was very interesting. . . . I had a really good time, good social time."[102]

He may have had a "good social time," but the curriculum was an important piece of his development as a military officer. Serving as one of the roughly 40 USAF officers in the class of about 140 students that included members of the armed forces and other agencies of the executive branch of the US government as well as American allies, Ritland matriculated through the six teaching "branches" at ICAF at the time: manpower, economic potential, requirements, procurement, production, and mobilization. Three years before, ICAF had added a unit on "joint strategic-logistics planning" and for Ritland's academic year had increased the emphasis on "management and executive skills." They were preparing the next generation of senior military officers, after all. But the school, which dates to 1922, was shifting, according to a 1983 history of ICAF, to pay "more attention to the basic role of economic factors in the conduct of war." The Cold War and the war in Korea, which had just reached a ceasefire that summer when Ritland moved to Washington, had required a "'limited' or 'grey' mobilization of the American economy to meet rising military requirements" and the students at ICAF were working on how to improve the nation's management of its wartime mobilization needs.[103]

Ritland, a member of ICAF's Committee 22, was part of the team looking at the large problem of mobilization of the American economy for war. For political reasons, the American economy was mostly unmobilized when the United States entered the war in 1941. Students were supposed to conduct "a study of the problems and methods of economic mobilization and reconversion, considered in their entirety, including their relationship with world affairs and free world security. . . . The purpose is to assure an understanding of the problems and methods involved in the establishment, integration and coordination of a national program of economic mobilization to support a partial or total defense effort."[104] Lecturers included people like Leslie Groves, the Army general who had led the Manhattan Project. Ritland worked on two reports, one individual report called "Production of Material for Atomic Energy" and one group project called "Mobilization of the National Economy in the Face of Atomic Attack," for which he served as committee vice chair alongside two Army colonels and one Navy captain. In this report, the team discussed "likely damage from an atomic attack," reviewed the "likely response to an atomic attack," identified "solutions for gaps and problems," and suggested a "strategy to solve the problem." At the end of the school year, all the committees briefed their ideas to the National War College, their neighbors across the street at Fort McNair.[105]

After the "good social time" of a year at ICAF, Ritland was tapped by General Bunker to work for him on nuclear issues.[106] The Air Force moved Ritland to the Pentagon in July 1954, where he worked in the Air Staff's Atomic Energy Division, supervising and coordinating atomic energy matters for the service.[107] He was part of the technical arm evaluating SAC's capabilities and getting them ready to pass their operational inspections. He also worked with the AEC again "on matters involving new weapons and things of that nature." The job was not "firsthand, day-to-day operations" but rather staff work, and it did not make a big impression on Ritland.[108] Ritland, however had already made a big impression on others.

While Ritland was busy solving the problems of mating nuclear weapons to American airplanes, the Soviets were deploying their first operational nuclear weapons and were testing their turboprop Tu-95 and M-4 jet bombers. The Soviets were also working on ICBMs. For the first time since Pearl Harbor, the United States worried about a surprise attack.[109] Recalled Ritland, the Soviets were "doing something and the strict security [in the USSR] did not allow us to find out anything about what they were doing . . . that's why the U-2 came along."[110] The Air Force struggled to find targets for its bombers, even creating a special organization called the Beacon Hill Study Group to research the problem. On June 15, 1952, two days after a reconnaissance variant of a Boeing B-29 bomber, commanded by Maj Samuel N. Busch, was shot down near Vladivostok with 12 men on board, the group released a report making a number of recommendations, including the development of a high-altitude reconnaissance plane that could stay out of the reach of the kind of interceptors that caught Busch's plane. The report recommended an aircraft capable of getting the needed information while flying in friendly airspace or with the ability to operate inside the USSR without being detected or shot down. Wrote journalist William Burrows, "No plane in service, certainly not Boeing's modified bombers, was capable of working over Soviet territory for long without inviting a political catastrophe."[111]

The Beacon Hill group suggested that safe altitude was about 70,000 feet and called for an airplane that could fly at that altitude and take pictures above the targets. That aircraft already existed on paper as the CL-282. Clarence L. "Kelly" Johnson, the engineering genius who headed Lockheed's Advanced Development Projects division (known throughout the industry as the Skunk Works), had thought of the CL-282 as a slower, long-winged version of his supersonic F-104 Starfighter. Wrote Burrows, LeMay "was briefed on the CL-282 in July 1954. Halfway through the presentation he stood up, took his cigar out of his mouth, and said that if he wanted high-altitude photographs he would put cameras in his B-36s (which he did). . . . he didn't want funding for what he derisively called 'boutique' airplanes—finicky specialty items—to come out of his bomber and missile budget."[112]

By July 1954, MIT President James R. Killlian Jr.'s Technical Capabilities Panel was worried about the appearance of the Soviet M-4 Bison four-engine bomber. The chair of the intelligence committee was Polaroid's Edwin "Din" Land, who wanted a high-flying plane to get as much intelligence on the Soviet military-industrial complex as quickly as possible. Land's panel also suggested that satellites could be developed as intelligence collectors but, Ritland recalled, we "didn't have a good idea of how far they were going, what the state-of-the-art was, what they were all about."[113]

On November 25, 1954, Ike met with CIA Director Allen Dulles, Secretary of State John Foster Dulles, Secretary of Defense Charles Wilson, Secretary of the Air Force Harold Talbott, CSAF Twining, now–Deputy Chief of Staff of the Air Force for Research and Development Lt Gen Donald Putt, and Air Force Gen C. P. Cabell, deputy CIA director. Ike agreed to buy 30 aircraft with funding from the CIA's special funds. According to historian John Schell, the Air Force was going to contribute the $35 million high-altitude Pratt and Whitney J57 engines, similar to engines they were using on other aircraft. But Ike wanted the CIA to have control of building the aircraft because he did not want the DOD bureaucracy, especially the Air Force, to get in the way and slow down production. He also wanted the CIA to fly the missions and analyze the photos because then it was out of the hands of the services and if a U-2 were lost or shot down, it could be described as a civilian aircraft, not a military one.[114]

Gardner gave Kelly Johnson the go-ahead over the phone. Eventually the subject of money came up, but no one knew the real cost or how it was going to be paid. The CIA's Richard Bissell recalled that at one meeting, "I looked down the table to the right and everyone was looking in my direction, and I looked down to the left and everyone from the left was looking in my direction. So I spoke up." They decided to use the CIA director's "special reserve fund . . . for the procurement of the airframe and most of the equipment."[115] Before Christmas 1954 they had a 15-page proposal from Lockheed. "For 27 aircraft the quoted price was about $19 million," Bissell recalled later. "This is of course without engines, without cameras or other payload. . . . [When] the 27th airframe was delivered, we were about $1 million under the estimate." [116]

Rumors began spreading in late 1954 that Ritland was due for a new assignment. His boss, Maj Gen Richard Coiner, who was Assistant Deputy Chief of Staff, Operations, for Atomic Energy, told him as much when he said to Ritland, "Hey, I understand you're going to leave us." They had worked together when Ritland was in New Mexico. Ritland replied, "Oh, where am I going to go?" to which Coiner said, "Well, I don't know. General Putt said that they're going to assign you somewhere." Ritland replied, "Well, I'd like to know maybe, sometime." Neither he nor Coiner could find out anything but as it turned out, they did not have to wait long.[117]

On December 10, 1954, Putt called Ritland into his E-Ring Pentagon office. With Putt was Lockheed's Kelly Johnson. They started discussing a new aircraft project for which they wanted Ritland to be the USAF's project manager, eventually to be called the U-2. Recalled Ritland, "The U-2 was to fly over Russia and get pictures. Our job was to build the plane."[118] With that, Ritland became Special Assistant to the Chief of Staff of the Air Force for Research and Development, serving as the Air Force project manager for the U-2 and the service's liaison with the CIA's Richard Bissell. He said later, "They outlined the purpose and preliminary understanding and definition of the total program, and it was going to be done in eight months, operational within a year, and over probably within a year and a half."[119]

Ritland had an important leadership role, too. He was not just the deputy program manager to the CIA's lead Bissell; he was also the leader of the Air Force team assigned to work on the program. All the military personnel assigned for full-time duty to the project were administratively assigned to a squadron for which Ritland was the commander, a small distinction denoting his military authority over the team. Ritland's team that staffed the project were officers selected by the senior generals in the Air Staff and were responsible for implementing the plans.[120] By August 1955, the CIA and the USAF had worked out a management arrangement. The Air Force chose the pilots and trained them, providing weather reports, mission planning, and support. The Agency chose and bought the cameras and handled security, contracting, film processing, and arrangements for foreign bases, though it also had a voice in the selection of pilots through the security process.[121] Lockheed built and tested the aircraft. The CIA remained in control of the program, but the USAF was a key partner. Said Bissell later, "The Air Force wasn't just in on this as a supporting element, and to a major degree it wasn't in on it just supplying about half the government personnel; but the Air Force held, if you want to be precise, 49 percent of the common stock."[122]

The CIA pointed out in its own declassified history of the U-2 program that

> it is easy to overlook the important role that the US Air Force played in the U-2 and OXCART programs. From the very beginnings of the U-2 program in 1954, the Agency and the Air Force were partners in advancing the state of the art in overhead reconnaissance. Air Force personnel served at all levels of the reconnaissance program, from project headquarters to the testing site and field detachments. The Air Force supplied the U-2's engines, at times diverting them from other high-priority production lines. Perhaps most important of all, the Air Force provided pilots for the U-2s after the Agency's original attempt to recruit a sufficient number of skilled foreign pilots proved unsuccessful. Finally, day-to-day operations of the U-2s could not have been conducted without the help of Air Force mission planners, weather forecasters, and support personnel in field detachments. The cooperation between the Agency and the Air Force that began with the U-2 and continued with Project OXCART remains a major feature in US reconnaissance programs today.[123]

Ritland ran his side of the U-2 program with one secretary and one telephone out of office 4E1037 in the Pentagon, constantly on the phone with Bissell and Johnson.[124] But the U-2 program had a high priority in the Department of Defense, so, Ritland recalled, "anytime I needed anything and anybody gave me any static, I'd just quote the code name and the guy would look in the book and say, 'Amen, don't worry.' "[125]

They wanted an isolated airfield for testing, but Bissell and Ritland looked at 50 possible sites and could not find one that met their security requirements. On April 12, 1955, Ritland, Bissell, Johnson, and Lockheed test pilot Tony LeVier jumped in a Beech Bonanza and flew up to an airfield Ritland knew from his days flying with the 4925th out of New Mexico. Recalled Ritland, "We didn't even get a clearance—AEC clearance—we went in low, and I went to this little X-shaped field that I'd flown over and over and over again on the bomb run where we'd dropped these weapons, and I'd spent enough time over there. It was an old, old World War II field. We flew over it and within 30 seconds, you knew that was the place because it was a stretched out thing in the sand which, over the years, had got hummocks and sagebrush that wouldn't quit, but it was right by a [dry] lake. Man alive, we looked at that lake, and we all looked at each other. It was another Edwards [AFB], so we wheeled around, landed on that lake, taxied up to one end of it, and Kelly Johnson said, 'We'll put it right here, that's the hangar.' "[126]

They flew back down to Los Angeles, but because the site was next to the Nevada Test Site, where Ritland had been many times before, there were problems to solve. Ritland returned to DC and met with his old Wright Field colleague Maj Gen Vincent Huston, who was then head of the Atomic Energy Commission's Division of Military Application.[127] Ritland told him what they wanted to do at the airfield. Then Ritland went back to his office in the Pentagon and wrote three memos for Assistant Secretary Gardner to sign: one for the Department of the Air Force, one for the AEC, and one for the Air Force's training command "that transferred this area up in there from the Air Force, to the Atomic Energy Commission. It was three quick memos to prevent the Training Command at Nellis from going too far in the gunnery range, up in that area. Later the Atomic Energy Commission had to transfer this to the Air Force because it was already an Atomic Energy Commission reservation." The whole process, Ritland recalled, "happened in one day, really."[128] Several weeks later the secret new base began to take shape.

Kelly Johnson put the aircraft in Lockheed's Skunk Works facility, a highly secure area he had used to develop the P-80 Shooting Star, the nation's first operational jet fighter aircraft. He put his engineers, mechanics, and draftsmen in the same space, about 50 feet from the assembly line, so when problems arose, everyone could quickly come together to fix problems. It could all be done without days of meetings and memos. Engineers simply made changes with "pencil notations on the engineering drawings in order to keep the project moving quickly." That arrangement was important because the initial design of the airplane had issues with fuel capacity and weight, and the wings, the CIA noted in its official history, were considered "the most challenging design feature of the entire airplane. Their combination of high-aspect ratio and low-drag ratio (in other words, the wings were long, narrow, and thin) made them unique in jet aircraft design. The wings were actually integral fuel tanks that carried almost all of the U-2's fuel supply."[129] Ritland understood how the Skunk Works approached aircraft design because he had worked with them during the war, had flown eight hours in the P-80, and even had one flight hour in the XP-80.[130] Bissell later recalled that "during the next three months, the focus was heavily on development. Basically, this involved a long series of experimental and development flights. At first, emphasis was exclusively on the airframe and engine, later on various subsystems, and then, as the first cameras began to be available, they were phased into the test site."[131]

The U-2 was a unique airplane. Although it was powered by the same J57 engines that powered other Air Force planes of the day, it looked nothing like those fast jets. It was made of lightweight aluminum to save weight for fuel, but that material "gave it the feel of a flying tin can." Its wings were 80 feet wide, nearly twice as long as the fuselage, because it had to have a lot of lift for the thin air of its operational altitude. But when parked, the wings drooped and so they were propped up by landing gear that fell off as the plane left the ground. Landing was tricky because of the unusual design. Recalled LeVier on his first test flight, "The lakebed was so smooth, I couldn't feel when the wheels were no longer touching . . . . I almost crapped [wrecked]." Then "when he touched down and slammed the breaks, both tires blew and the brakes caught fire, which brought out the fire truck." Three days later he flew the U-2 up to 8,000 feet in a driving rainstorm and again had a difficult landing because the U-2 began "bouncing violently."[132] According to aviation historian Richard Hallion, "The U-2 presented some unique challenges, as Tony LeVier discovered on its first flight. Attempts to land it like a conventional sailplane proved unsuccessful; the U-2 simply would not quit flying. Johnson, in resigned tones, advised LeVier to finally climb to altitude and abandon the prototype. At that point, LeVier summoned up all his years of experience and decided to land the plane, which had a unique bicycle-like landing gear, like any 'tail dragger.' And it came in smoothly and gracefully. Future U-2 pilots learned to stall the plane just off the ground before touchdown, otherwise it would coast and coast down the runway."[133]

In front of Bissell, Ritland, and others, LeVier took the U-2 on a test flight on August 8, 1955, flying it up to 32,000 feet and landing without any bumps, describing the airplane as "very light, very fragile, [and] very flimsy."[134] But they had made their eight-month goal and began production soon after.[135] According to Kelly Johnson, the project came in $2M under cost and bought "six extra airplanes from spare parts we didn't need because the U-2 functioned so well."[136] LeVier then trained other pilots, teaching them the intricacies of flying the U-2 that he also said flew like a "baby buggy," including and maybe especially the importance of watching airspeed at maximum altitude when the difference between a low-speed stall and a high-speed buffet was just six knots, which the pilots eventually called "coffin corner."[137] Wrote historian Hallion, "Sadly, the U-2 program did not proceed without fatalities; crashes during development testing claimed the lives of Robert Sieker and Pat Hunerwadel early in the program. . . . Nevertheless, testing at Edwards and at a secret Nevada test site known as Watertown Strip and dubbed 'The Ranch' confirmed the basic excellence of the design."[138]

Recalled Ritland, "We developed everything new, extending the state of the art, new fuel, new operating locations, total security, new concepts, new suits, new human factors, new training methods, you name it; it had never been done before. We just got the right kind of people. We didn't get a lot of them; we just got the ones that could do the job. I don't understand how we ever did it. We built a new field; got gas out there; got Shell Oil Company, through Jimmy Doolittle [Lt Gen James H., AAF], to build us a new nonvolatile fuel; delivered it out into the desert area; selected the field; flew for three years; and nobody ever knew the airplane existed."[139]

There was speculation in the US press and in Congress of a capabilities gap between US and USSR, that is, that the Soviets had more missiles and bombers. SAC's LeMay supported the idea because it might mean more money for B-52s and more importantly could save the lives of airmen that were being lost in Soviet shootdowns of American and allied reconnaissance aircraft. According to author William Burrows, 162 airmen from the Air Force and the Navy lost their lives in reconnaissance missions using reconnaissance variants of the B-47 over and near communist-held territory.[140] But Ike kept approving flights near and over the USSR because although he saw them as very dangerous, they were providing necessary information about Soviet capabilities.[141]

As the U-2 began to look like it was going to become reality in the summer of 1955, SAC's LeMay began to argue for SAC to control the U-2, what Bissell called "a major jurisdictional dispute" with LeMay.

> There never had been any kind of a written arrangement or agreement between the Air Force and the Agency defining the roles of the two organizations. . . . Col Os. [sic] Ritland, appointed by the Air Force, was still my deputy in the Pentagon lending support. But by mid-summer it was pretty clear that we had to reach some agreement about who was going to have what responsibilities for training crews, recruiting pilots and ultimately for the operational phase. . . . The project organization was [eventually] formalized. It was agreed the CIA director would appoint the director of the project (myself) and the Air Force would appoint the deputy, Os [sic] Ritland, who was very welcome to me. . . . SAC would form a special squadron of selected SAC officers . . . [who] would remain in the SAC chain of command.[142]

The initial cadre of American U-2 pilots hired were SAC fighter pilots with reserve commissions who had to resign their commissions and then be hired as civilian pilots for the U-2 program. To recruit reluctant military pilots with good careers, CIA offered them "handsome salaries, and the Air Force promised each pilot that, upon satisfactory conclusion of his employment with the Agency, he could return his unit," while still being considered for promotion with his peers in the service.[143] They could expect to make $1,500 a month while training and then $2,500 when deployed overseas at a time when a USAF captain (O-3) earned around $400 a month. Bissell, according to author Monte Reel, "persuaded a few cooperative air force officials to wade through America's roster of pilots, searching for the who might be suited to join the CIA and fly the U-2. The pilots had to be between twenty-five and thirty-five years old, with at least five hundred hours at the controls of a jet, with experience using celestial navigation, and with [stellar] physical and psychological assessments."[144] Bissell interviewed the squadron commanders about the 18 pilots they chose from Turner AFB near Albany, Georgia, including a young lieutenant named Francis Gary Powers. His commander raved about Powers's skills as a pilot in the Republic F-84G Thunderjet and mentioned that he had finished advanced survival training, including how to resist brainwashing, and had earned a top secret security clearance because he was one of the few SAC fighter pilots who might be called upon to use nuclear weapons. Powers was also a good athlete who had once bailed out of an aircraft.[145]

The CIA wanted pilots who were physically and mentally fit for the long missions. The Agency contracted in November 1955 with the Lovelace Clinic in Albuquerque, run by USAF flight surgeon and retired Brig Gen Albert Schwichtenberg, at what readers will recall was the same clinic that in 1959 helped select the first groups of American astronauts. Astronaut Deke Slayton remembered the clinic as a "nightmare. Take the standard medical examination, where they check your heart and they check your blood and they stick things in your body, and multiply it by ten." The clinic rejected a number of candidates the Air Force had proposed, but the CIA contends its process contributed to a lower accident rate for CIA pilots compared to military pilots who flew the U-2 in later years.[146]

While Ritland and others worked on the U-2, the United States began another reconnaissance program in 1955 because of the desperate need for intelligence about the USSR and, after June 1950, about the war on the Korean peninsula. RAND had proposed a solution that was not space-based because they felt the state of the technology at the time would not provide the kind of resolution photo interpreters needed for military purposes. Instead, RAND proposed the Air Force execute a different kind of program, called Genetrix or Weapon System 119L, involving high-altitude balloons flying over the Soviet Union. RAND scientists William Kellogg and Stanley Greenfield began by studying the Japanese balloon program in World War II, determining that "a balloon made a suitably stable platform for high-altitude photography."[147] Conceived in 1950, Genetrix used polyethylene balloons in test flights over New Mexico, but the program did not gain traction until 1955 when, with an official cover story from the Navy as a meteorological program called Moby Dick, the United States launched balloons with cameras and radios into the jet stream from Western Europe, then left them to drift over the USSR so the balloons could be recovered over the Western Pacific. Planes based in Japan flew over the balloons and caught them. The film could be processed back in the United States.[148]

Capt Harold Mitchell, a pilot in the 456th Troop Carrier Wing, trained for the recovery mission in a program they called Drag Net using a C-119 Flying Boxcar as the recovery aircraft. The recovery crew that flew with Mitchell in the airplane's hold trained as winch operators and pole handlers to snag the balloons. The airplanes had extra fuel tanks so they could stay aloft for 13 hours and were modified so the doors could be opened in flight, which allowed two poles to be extended from the rear of the aircraft. Loops of nylon rope with hooks were strung between the poles, which were lowered from the back of the airplane, and the hooks caught the parachute as the C-119 flew over it.[149]

After some classroom training, Mitchell and his crew flew up to 12,000 feet. Another C-119 was at 15,000 feet and released a sand-filled 50-gallon drum or 300-pound concrete block simulating a balloon gondola. The gondola was attached to four 28-foot personnel parachutes that were attached by a 100-foot nylon riser to a 15-foot reinforced drogue chute. Mitchell's crew deployed their recovery equipment and attempted to snag the drogue chute by flying over it close enough to snare the chute in the nylon loop. If they could make five catches, they were certified for aerial recovery.[150]

In December 1955, Ike approved two months of balloon flights, during which the Air Force launched between 400 and 500 balloons from West Germany. The Drag Net pilots only recovered 46; the rest were lost in flight. The Soviets called them "espionage balloons," shooting down as many as they could and then displaying recovered "gasbags, cameras, and transmitters" to the public in a February 1956 press conference. The Soviets protested the balloon flights as a "gross violation" of their airspace.[151] Ike claimed the balloons were for "monitoring high-altitude weather conditions," a claim he would make about other systems in the near future, but Ike cancelled Genetrix because, according to historian Philip Taubman, the "military gains of the balloon flights did not outweigh the political damage created by their discovery." The Genetrix coverage was "spotty," according to historian Curtis Peebles, and photos that were usable were mostly of the southern part of the Soviet Union when the most desired information was in the north.[152] Walter Levinson, project manager for the balloon cameras, said that about 40 balloons made it all the way across the USSR and provided photographs of over a million square miles of the Sino-Soviet bloc. But Soviet protests of the flights with captured balloons as evidence and a story in *The Washington Post* finalized the end of the Genetrix program in March 1956.[153]

According to the CIA's official history of the U-2, Bissell and his staff had already begun working on the problem of a cover story for the U-2 in February 1956. Ike had complained after one shoot-down of another US aircraft that there had been no cover story to explain that they were not reconnaissance aircraft but something else.[154] If the U-2 was going to take off and land from overseas airfields, the United States needed something to explain why it looked so different from every other plane ever flown. They finally settled on a cover story of the U-2 as a weather observation system—which, in the days before weather satellites, was certainly plausible—that was being flown by the National Advisory Committee for Aeronautics, or NACA (NASA's predecessor).[155] According to Reel, Bissell wrote the NACA press release released under NACA chairman Hugh Dryden's name.[156] Kelly Johnson recorded in his memoir, *More Than My Share*, that the NACA issued a press release on May 7, 1956, about the U-2 as a high-altitude research plane in an attempt to establish the cover story early on. "Tomorrow's jet transports will be flying air routes girdling the earth . . . at altitudes far higher than presently used except by a few military aircraft," Dryden explained. "The availability of a new type of airplane . . . helps to obtain the needed data . . . about gust-meteorological conditions to be found at high altitude . . . in an economical and expeditious manner." NACA intended the U-2 to help research "clear air turbulence, convective clouds, wind shear, and [the] jet stream. Also to be studied were cosmic rays and concentration of certain elements in the atmosphere including ozone and water vapor." The first data to be gathered, the NACA said, would be about conditions in the Rocky Mountains using flights from Watertown Strip, Nevada.[157] Then on July 9, another

NACA release explained that the U-2 was overseas "at Lakenheath, England, where the Air Weather Service of the USAF is providing logistical and technical support. As the program continues, flights will be made in other parts of the world."[158]

With the U-2 ready to fly, Genetrix cancelled, space-based reconnaissance technology not looking promising, and his Open Skies proposals rejected, Ike approved the joint USAF/CIA plan for U-2 overflights of denied areas, starting with flights over the Eastern Bloc and then authorizing flights over the USSR itself. The U-2's "life expectancy was put at two years or less, during which time it was supposed to collect a windfall of intelligence from deep inside the USSR," wrote author Burrows. "John Foster Dulles later quoted Ike as saying: 'Well, boys, I believe the country needs this information, and I'm going to approve it. But I'll tell you one thing. Some day, one of these machines is going to be caught, and we're going to have a storm.' That was prescient."[159] Recalled Ike in his memoirs, "When the Soviets rejected my Open Skies proposal in 1955 I decided that more intelligence about their war-making capabilities was a necessity. So I directed that we would begin aerial reconnaissance, making use of the then relatively invulnerable, high-flying U-2 aircraft. It had been making some weather flights, but from 1956 onwards its basic mission was to provide us with current information on the status of the Soviet missile and armaments programs."[160] He was so concerned about eventual detection of the U-2 that he approved flying over the most important targets in the USSR from the beginning of the program before the Soviets could counteract the U-2, which they eventually did.[161]

Despite the rush to get it done, the program came in on schedule, under budget, and above capability, resulting in 20 airplanes. Amazingly, 10 months after the first test flight, they had their first operational missions. The Soviets tracked the U-2 from day one but couldn't shoot it down because it was too high for their AAA, which were limited to about 60,000 feet at the time.[162] On July 4, 1956, pilot Hervey Stockman flew the first mission over the USSR, grabbing intelligence on the suspected long-range Bison airfields around Minsk and Leningrad. The next day, pilot Carmen Vito flew directly over Moscow and, according to the CIA, "became the only U.S. pilot to overfly the Soviet capital city. . . . CIA analysts claimed that this one flight provided as much intelligence as was typically gained over a whole year." The flights revealed that the instead of having over 100 operationally ready M-4 Bison bombers, as the US Air Force claimed, the Soviets did not have a single bomber at any of the nine airfields imaged. And imagery showed "no indication of significant production at the Bison plant."[163] Ike may have slept better the night he received that intelligence briefing.

Among the other sites initially flown over in Russia were "Tyuratam and Kapustin Yar and that area," Ritland recalled, "where we knew that they were launching missiles and to see what it looked like. Lo and behold, the first flight came back and did indeed alarm any individual who saw the extensive hardware and operational and experimental facilities that were in being at that time. It was beyond comprehension in comparison to our effort. . . . This then gave impetus to pushing the ballistic missile program."[164] It soon became apparent that Soviet engineers were not that far ahead of Schriever's team and actually struggling through some of the same problems, ones that the United States solved sooner on their way to an operational ICBM capability in time for the 1962 Cuban Missile Crisis, a capability the Soviets would not yet have.

According to the CIA's own declassified history of the U-2 program, the airplane revolutionized the agency by completely reorganizing and refocusing it into making "overhead reconnaissance . . . one of the CIA's most important missions." The CIA's own assessment of the impact of the U-2 shows the revolutionary changes taking place in intelligence gathering at the time.

> CIA's entry into the world of overhead reconnaissance at the end of 1954 ultimately produced major changes in the Agency. Classical forms of intelligence—the use of covert agents and clandestine operations—gradually lost their primacy to the new scientific and technical means of collection. As soon as the U-2 began flying over the Soviet Union, its photographs became the most important source of intelligence available. The flood of information that the U-2 missions gathered led to a major expansion of the Agency's photointerpretation capabilities, which finally resulted in the creation of the National Photographic Interpretation Center to serve the entire intelligence community. . . . Less than a decade after the U-2 program began, the

> Agency's new emphasis on technical means of collection had brought about the creation of a new science-oriented directorate, which would ultimately rival in manpower and budget the Agency's other directorates combined.[165]

The ways the intelligence community used the U-2 had an immediate impact on American deterrence capabilities. According to author Burrows, "The flights covered 1,300,000 square miles—15 percent of the Soviet Union—and returned with strips of film which, laid end to end, would have been 250 miles long. The Target Data Inventory and Bombing Encyclopedia were stuffed with the U-2's take. So were 5,425 separate analytical reports supplemented with photographs." They showed the bomber gap and the missile gap did not exist. Burrows quoted SECDEF Thomas S. Gates Jr. after the U-2 overflights ended: "'From these flights we got information on airfields, aircraft, missiles, missile testing and training, special weapons storage, submarine production, atomic production and aircraft deployment . . . all types of vital information.' "[166]

Among the people involved in the U-2 program with whom Ritland met "practically every day" was civilian R&D chief Gardner, Ritland recalled. Gardner "was concurrently working with Schriever on the ballistic missile program in 1954." At one point, Gardner expressed that he wanted to run the ballistic missile program like the U-2 program: in a small organization with full and complete authority and responsibility to get the job done. He hoped this approach would accelerate missile development because that had not happened when Schriever had taken over the missile programs in 1954 and moved development to Los Angeles, away from DC but close to the aircraft manufacturing companies that would have to build the missiles.[167]

The distance also meant Schriever was on a cross-country flight nearly once a week, which he recalled later was a little like being "a shuttlecock in a badminton game."[168] He would work all day on the West Coast, fly overnight to DC, meet with senior officials, and fly back to California, usually the same day.[169] Understandably, Schriever wanted a deputy to run the programs while he travelled, so, in April 1956, Ritland got orders to become the deputy commander of the ballistic missile program in California and earned his second Legion of Merit award for the work he did in the Pentagon.[170] In charge of his own program, Schriever could and did get any officers he wanted for his staff. "I wanted them," Schriever said, "because they were smart and would tell me not what I wanted to hear, but what they really thought."[171] Said an officer years after working for Schriever, "Anyone not in good physical condition, who doesn't have a trigger-quick mind, had better not work for this general."[172]

Many of Ritland's friends were skeptical of the position, calling Schriever's outfit a "fly-by-night organization, said it would never fly, and that [he would] be looking for a job one of these days," said Ritland. General Putt observed later that "R&D personnel were sort of second-class citizens in the [Air Force]. . . . Operational people looked down on them and what not. But I think as time went by and there was a greater and greater appreciation of the necessity for good research and development and what it could do for the operational forces, these attitudes changed."[173] And Putt certainly had a say in his old test flying buddy Ritland getting assigned to California.

Before he left for California to begin his new assignment, Ritland wrote letters to his associates in the U-2 program to thank them for their "wholehearted cooperation given to our activities." To Johnson specifically, he wrote in a letter dated March 30, 1956,

> In your case I feel such a letter too formal since you have always known of my high regard and full appreciation for all of your performances. After some 15 years of close association with you there is no indication that the future will change such a relationship. So, old buddy, although I officially leave the project now, I will always remain highly interested in it and will help in any way possible to make it a complete success.
>
> Sincerely, Kelly, this has been the most invigorating and productive activity I have ever experienced. I feel sure that the project will be, as it has been, a complete success. You must always remember that you have a number one supporter in me.
>
> With warmest personal regards and best wishes.
>
> O. J. Ritland, Colonel, USAF[174]

Johnson replied in a handwritten note on his own personal stationery a couple of weeks later.

> I deeply appreciate your letter upon leaving the special project. Let me say on my side that I fully feel toward you all the nice things you said concerning our 15 years of association. I never again expect to have such a fine relationship with anyone through such a difficult project and period. It's with a certain feeling of frustration that I write this because you are leaving just about when the fruits of our labors are becoming ripe and it's not right to have you leave now without getting your full share of credit and satisfaction. . . .
>
> Best wishes in your new job—and *thanks* Ossie. . . . Fondest regards, Kelly.[175]

But the excitement of the first U-2 successes did not last. When President Eisenhower answered an afternoon phone call from his military assistant, Gen Andrew Goodpaster, on May 1, 1960, he got bad news. One of the U-2s flying out of Turkey was overdue and had probably crashed.[176] Early the next morning, Goodpaster delivered an update in person. The CIA reported the plane was flying 1,300 miles inside the USSR when the pilot relayed an engine flameout. Nearly two days went by, and they still had no word on the fate of the pilot, Francis Gary Powers. Powers was among the most experienced U-2 pilots with about 600 hours in the plane, so there was reason to hope. Then on Friday, May 6, Ike recalled in his memoir, Soviet premier Nikita Khrushchev announced that "the uninjured pilot of our reconnaissance plane, along with much of his equipment intact, was in Soviet hands." A week later Ike cancelled all further planned U-2 flights over Soviet territory for two reasons; in his words, first, because "the U-2 was probably no longer a reliable plane to use for this purpose. The second was that considerable progress was now being made in photography of the earth from satellites."[177]

Key to making that photography from air and space possible was Osmond Ritland. At Ritland's retirement dinner, the emcee read from a letter Bissell had written: "It was largely through your efforts that this undertaking moved as rapidly and successfully as it did. Less than eight months after you went to work on this enterprise, there was a successful first flight. In this and in other activities, which I know intimately and firsthand, you made one of the largest individual contributions to the successful achievement of national objectives, the importance of which can hardly be exaggerated."[178] Lockheed's Kelly Johnson, who was not at the dinner, was quoted in another letter read at the gathering as saying, "This U-2 program would never have gotten off the ground without Ossie Ritland."[179]

While the U-2 was instrumental in determining that the USSR was not capable of a surprise nuclear attack—yet—the problems associated with building and operating ICBM systems to deter the Soviets from ever attacking remained. And the person to help get through these problems was going to be Osmond Ritland.

Notes

1. Doolittle interview quoted in Jacob Neufeld, *Ballistic Missiles in the United States Air Force* (Office of Air Force History, 1990), 96, 341n3.

2. Vincent T. Ford, "'Twenty-Four Minutes To Checkmate,' 1953–1957," unpublished manuscript, circa 1997, Eisenhower Library, 283–301.

3. Ford, 301; and United States Department of Energy, *United States Nuclear Tests July 1945 through September 1992* (National Nuclear Security Administration Nevada Field Office, DOE/NV-209-REV 16, September 2015), 4–5.

4. Ritland oral history, 129.

5. Ford, "'Twenty-Four Minutes To Checkmate,' " 301–2.

6. Ford, "'Twenty-Four Minutes To Checkmate,' " 302–3.

7. Ford, "'Twenty-Four Minutes To Checkmate,' " 304–6.

8. Albert Rosenfeld, "Airdrop in Nevada," *New Mexico Quarterly* 25, no. 4 (1955): 368–76.

9. Ford, "'Twenty-Four Minutes To Checkmate,' " 306–8.

10. Ford, "'Twenty-Four Minutes To Checkmate,' " 308; Rosenfeld, "Airdrop in Nevada," 376; and Doyle Kline, "They Dropped Bomb in A-Test: 'Routine' Job, Local AF Men Say," *The Albuquerque Tribune* (April 26, 1952), 1.

11. "Atomic Tests Light Up Four States," *LIFE* (February 12, 1951), 25.

12. Ritland, "Keynote Address."

13. Walker and Wickam, *From Huffman Prairie to the* Moon, 245.

14. "Lieutenant General Laurence Carbee Craigie," official biography, no date, https://www.af.mil/, accessed September 2, 2022.

15. Ritland biography, January 26, 1951, 128, Box 2, Misc papers, Ritland papers.

16. Ritland oral history, 65.

17. Ritland oral history, 92–93.

18. Ritland oral history, 56, 58, 70, 93–95.

19. Ritland oral history, 71.

20. "The Job of Air Corps Test Pilots," *Air Corps News Letter* (July 1, 1941), 24–25.

21. Ritland oral history, 97–99.

22. Ritland oral history, 105–9; and Henry Fountain, "Dr. Donald [Don] D. Flickinger, 89, A Pioneer in Space Medicine," *The New York Times* (March 9,

1997), Gale in Context via Ebscohost, accessed August 19, 2022. For more on Flickinger's contributions to the Mercury space program, see for example Mae Mills Link, *Space Medicine in Project Mercury* (NASA, SP-4003, 1965). See also, Jim Tuttle, *Eject!: The Complete History of US Aircraft Escape Systems* (MBI Publishing, 2002).

23. Ritland oral history, 102–5; and "Pilot Ejector," *LIFE* (November 18, 1946), 53.

24. Lt Col M. W. Boynton made a free-fall parachute jump in August 1944 from 42,000 feet without using the "automatic parachute opening device," apparently making "no attempt to pull the rip cord" and "plummeted to his death." See Vincent Mazza et al., "High Altitude Bailouts," report ADA323449, September 18, 1950, 3, https://apps.dtic.mil/, accessed July 1, 2021.

25. Ritland oral history, 105.

26. Ritland oral history, 105–9.

27. Ritland oral history, 106–9.

28. John D. Hardison, *The Megaton Blasters: Story of the 4925th Test Group (Atomic)* (Boomerang Publishers, 1990), 6.

29. Curatola, *Bigger Bombs for a Brighter Tomorrow*, 56.

30. Hardison, *The Megaton Blasters*, 6; and Deaile, *Always at War*, 73–75, 121.

31. Curatola, *Bigger Bombs for a Brighter Tomorrow*, 72.

32. Ritland oral history, 111–14.

33. Wright, "Major General Blazes Path in Air Force History," 8.

34. Ritland oral history, 112–13.

35. "Major General Howard G. Bunker," Official Biography (May 1955), https://www.af.mil/, accessed August 31, 2022. Col Donald L. Putt followed Bunker as chief of the Air Technical Section when Bunker moved up to lead all the technical services for all US strategic forces.

36. Ritland oral history, 112–13.

37. Kline, "They Dropped Bomb in A-Test," 5; and "Major General John S. Mills," official biography (October 1956), https://www.af.mil/, accessed November 22, 2022.

38. Hardison, *The Megaton Blasters*, 7.

39. 4925th Special Weapons Group, History (July 1, 1950–December 31, 1950), 1–10, AFHRA, IRISNUM 00445990. There was a name change in 1951 from 4925th Special Weapons Group to 4925th Test Group (Atomic) to bring it more in line with similar Air Force units.

40. Hardison, *The Megaton Blasters*, 7.

41. Kline, "They Dropped Bomb in A-Test," 5.

42. Hardison, *The Megaton Blasters*, 7.

43. Letter, Col. W. J. Watkins to Maj. S. R. Kalmus, no subj, November 18, 1965, 2–3, Ritland papers.

44. Kline, "Local Expert on Dropping A-Bomb," 4.

45. "Missions of 4901st, 4925th Are Explained by AEC," *Atomic Flyer* 5:35 (April 25, 1952), 1, provided by Kathleen Ritland Montoya to the author.

46. Ritland oral history, 114.

47. Hardison, *The Megaton Blasters*, 7.

48. Hardison, *The Megaton Blasters*, 7.

49. Hardison, *The Megaton Blasters*, 33.

50. Larsen, "Gen. Mills, Col. Ritland Key Men," 10.

51. A. Costandina Titus, *Bombs in the Backyard: Atomic Testing and American Politics* (University of Nevada Press, 1986), 55-56.

52. Titus, *Bombs in the Backyard*, 58.

53. Titus, *Bombs in the Backyard*, 56–57.

54. Titus, *Bombs in the Backyard*, 56.

55. U.S. Government, film, "Target Nevada," Ritland family films, disc 13.

56. Ritland oral history, 115–20.

57. "Missions of 4901st, 4925th Are Explained by AEC," *Atomic Flyer* 5:35 (April 25, 1952), 1.

58. Ritland oral history, 119–20; and Ritland quoted in Kline, "They Dropped Bomb in A-Test," 5.

59. "Atomic Tourism in Nevada," PBS.org (n.d.), https://www.pbs.org/, accessed November 26, 2022; and US Department of Energy, "News Nob," August 2013, https://www.nnss.gov/.

60. Rosenfeld, "Airdrop in Nevada," 371, 375.

61. Laura Bliss, "Atomic Tests Were a Tourist Draw in 1950s Las Vegas," Bloomberg (August 8, 2014), https://www.bloomberg.com/.

62. "Operation 'Doom Town'," *Nevada Highways and Parks* (June–December 1953), 3–14. A copy is in Box 4 of Ritland's papers and can be seen at https://archive.org/, accessed December 13, 2022.

63. National Atomic Testing Museum, https://www.atomicmuseum.vegas/, accessed November 23, 2022.

64. Ritland oral history, 125–26, 130.

65. Kline, "They Dropped Bomb in A-Test," 5.

66. Ritland oral history, 115–20.

67. Larsen, "Gen. Mills, Col. Ritland Key Men," 10.

68. Kline, "Local expert on Dropping A-Bomb," 1.

69. Letter, Col. W. J. Watkins to Maj. S. R. Kalmus, no subject, November 18, 1965, 2, Ritland papers.

70. Kline, "Local Expert," 4.

71. Ritland oral history, 128–30.

72. Ritland oral history, 128–29.

73. Air Force Chief of Staff Gen Hoyt S. Vandenberg sent a thank you letter to Ritland and team for their efforts at a March 1953 open house at Indian Springs AFB. Wrote Vandenberg, "From all accounts, the personnel who participated in the open house reflected great credit upon themselves and the entire Air Force, and I wish to add my appreciation of the outstanding manner in which you and personnel of your command fulfilled your responsibilities in connection with this project." (Vandenberg to Gen. Mills, Subj: "Letter of Appreciation," May 2, 1953, 103, Box 2, Misc papers, Ritland papers.)

74. Ritland oral history, 121.

75. Ritland oral history, 120–21.

76. Ritland oral history, 122–23.

77. Carroll L. Tyler, manager, AEC, to Col. Ritland, no subject, June 20, 1952, 119, Box 2, Misc papers, Ritland papers.

78. Larsen, "Gen. Mills, Col. Ritland Key Men," 10.

79. "Crew Members Call A-Drop 'Routine,' " *The Stars and Stripes* (April 29, 1952), 7.

80. "Wherever You Look There's Danger in Las Vegas," *LIFE* (November 12, 1951), 37; and "2,150 Marines Await New Bomb Trial Today," *Stars and Stripes*

(April 29, 1952), 7. The Marines were there to participate in a test after "Army infantrymen, paratroopers and Air Force ground troops" had "met the mighty atom on simulated battle grounds." Tens of thousands of American service-members participated in the test program.

81. "New Weapons for the GIs," *LIFE* (November 12, 1951), 38.

82. LTC Stump to Col. Ritland, Subj: "Military Order of Atomic Redlegs," June 11, 1953, 113–14, Box 2, Misc papers, Ritland papers.

83. Wright, "Major General Blazes Path in Air Force History," 8, 23.

84. Montoya, interview.

85. Larsen, "Gen. Mills, Col. Ritland Key Men," 10.

86. Harry S. Truman, *Memoirs*, vol. 2, *Years of Trial and Hope* (Doubleday and Company, 1956), 314.

87. Kline, "They Dropped Bomb in A-Test," 5.

88. Truman, *Memoirs*, 312.

89. Hardison, *The Megaton Blasters*, 36.

90. United States Department of Justice, "Radiation Exposure Compensation Act" (February 21, 2023), https://www.justice.gov/.

91. *United States Nuclear Tests July 1945 through September 1992*, ix, 45.

92. "King-Size Atom Bomb Touched Off," *The Albuquerque Tribune* (June 4, 1953), 1; "Col. Ritland Flies Last Atomic Test Mission From Here," *The Albuquerque Tribune* (June 4, 1953), 24; and "Last Test Mission Flown," *The New York Times* (June 5, 1953), 10.

93. Kline, "Local Expert on Dropping A-Bomb," 4; and Vera Busch, "Juvenile Styles Charming at Theta Children's Show," *The Albuquerque Tribune* (August 13, 1952), 8.

94. Kline, "Local Expert on Dropping A-Bomb," 4.

95. This was a draft medal citation as the actual medal had to go through the bureaucratic wickets and was not actually presented until December, while Ritland was a student at ICAF. Details of the change of command are from family film of 1953 Kirtland Change of Command Ceremony. The quip is from the retirement dinner. Both were provided by daughter Kathleen Ritland Montoya. "The Ritland Fan Club," retirement dinner, on or about December 1, 1965. Trk 3, about 26 min mark.

96. Citation, Legion of Merit, October 14, 1953, Box 2, Misc papers, Ritland papers, 77–79. ICAF commandant RAM Wesley Hague presented the award December 3, 1953.

97. Gen. Mills to Col. Ritland, Memo, Subject: "Meritorious Service," August 11, 1953, Box 2, Misc papers, Ritland papers, 92–93.

98. Maj. Hurley to Col. Ritland, memo, Subj: "Special Duty (Operation Honor)," June 17, 1953, Box 2, Misc Papers, Ritland Papers.

99. Kline, "Local expert on Dropping A-Bomb," 1, 4.

100. Ritland oral history, 136–37.

101. Hardison, *The Megaton Blasters*, ii. The forward is dated "February 1988 Rancho Santa Fe, California."

102. Ritland oral history, 133.

103. Theodore W. Baver, *History of the Industrial College of the Armed Forces* (Alumni Association of the Industrial College of the Armed Forces, 1983), National Defense University Archives, IV-15.

104. Education Division, "Annual Report," Industrial College of the Armed Forces (July 1954), National Defense University Archives, 47.

105. Education Division, "Annual Report," 49–50; and Osmond J. Ritland, "Production of Material for Atomic Energy," ICAF Report M54-110 (12 March 1954), National Defense University Archives. Ritland's committee 22 classmates were Col Victor C. Searle (Army Chemical Corps), who was the chair; Capt Howard T. E. Anderson (US Navy), who was the editor; and Col Lyle W. Bernard (Army, Infantry), who was the spokesman.

106. Ritland oral history, 134.

107. "Major General Osmond J. Ritland Inducted in 1989," Air Force Space and Missile Pioneers Hall of Fame (n.d.), https://www.spaceforce.mil/, accessed May 30, 2023.

108. Ritland oral history, 133–34.

109. Peebles, *Dark Eagles*, 21.

110. Ritland oral history, audio recording, Disc 3, Trk 8, about 3:50.

111. William E. Burrows, *By Any Means Necessary: America's Secret Air War in the Cold War* (Farrar, Straus and Giroux, 2001), 231. Busch and most of his crew were captured.

112. Burrows, *By Any Means Necessary*, 232.

113. Ritland oral history, 227.

114. Burrows, *By Any Means Necessary*, 233; James R. Killian, *Sputnik, Scientists, and Eisenhower* (MIT Press, 1977), 82; and John A. Schell, "The SA-2 and U-2: Secrets Revealed," *Air Power History* 68, no. 2 (2021): 23.

115. Richard M. Bissell, "Origins of the U-2," *Air Power History* 66, no. 1 (1989): 16.

116. Bissell, "Origins of the U-2," 17.

117. Ritland oral history, 139–40; "Major General Richard T. Coiner Jr.," official biography (March 1964), https://www.af.mil/, accessed October 5, 2022.

118. Wright, "Major General Blazes Path in Air Force History," 23.

119. Ritland oral history, 140.

120. Gen Nathan Twining, Chief of Staff, and Allen Dulles, CIA director, "Organization and Delineation of Responsibilities [of] Project Oilstone [the U-2's first program name]" (August 2, 1955), Approved for Release in March 2002, Digital National Security Archive, https://nsarchive2.gwu.edu/, accessed December 22, 2022.

121. Central Intelligence Agency, *The Central Intelligence Agency and Overhead Reconnaissance: The U-2 and Oxcart Programs, 1954–1974*, 60, https://www.archives.gov/. Hereafter CIA U-2 history.

122. Bissell, quoted in CIA U-2 history, 61.

123. CIA U-2 history, 321.

124. Ritland oral history, 140–41.

125. Ritland oral history, 216.

126. Ritland oral history, 143; and Peebles, *Dark Eagles*, 90.

127. Biography, "Major General Vincent Gg. Huston" (August 15, 1967), https://www.af.mil/, accessed July 17, 2023.

128. Ritland oral history, 143–44; Schell, "The SA-2 and U-2: Secrets Revealed," 26; and Francis Gary Powers Jr. and Keith Dunnavant, *Spy Pilot: Francis Gary Powers, the U-2 Incident and a Controversial Cold War Legacy* (Prometheus Books, 2019), 37.

129. CIA U-2 history, 44–75.

130. Those nine flight hours are as of 1952. Box 1, Ritland papers. The P-80 was redesignated as F-80 in 1948, so these are likely flight hours from New Mexico.
131. Bissell, "Origins of the U-2," 18.
132. Dunnavant, *Spy Pilot*, 38–40.
133. Hallion, *Test Pilots*, 227–28.
134. Dunnavant, *Spy Pilot*, 40.
135. CIA U-2 history, 69–71.
136. Clarence L. Johnson with Maggie Smith, *Kelly: More Than My Share of it All* (Smithsonian Institution Press, 1985), 124.
137. Dunnavant, *Spy Pilot*, 40; and CIA U-2 history, 76.
138. Hallion, *Test Pilots*, 227–28.
139. Ritland oral history, 142.
140. Burrows, *By Any Means Necessary*, 353–56.
141. Burrows, *By Any Means Necessary*, 350. This sentiment is attributed to Ike by General Goodpaster.
142. Bissell, "Origins of the U-2," 18–19.
143. CIA U-2 history, 74–76.
144. Monte Reel, *A Brotherhood of Spies: The U-2 and the CIA's Secret War* (Doubleday, 2018), 79–80, 84; and MilPayTable1952, available from https://www.dfas.mil/, accessed October 14, 2022.
145. Reel, *A Brotherhood of Spies*, 79–80, 84.
146. CIA U-2 history, 74–75; and Donald K. Slayton with Michael Cassutt, *Deke! U.S. Manned Space: From Mercury to the Shuttle* (Forge Books, 1994), 72.
147. Merton E. Davies and William R. Harris, *RAND's Role in the Evolution of Balloon and Satellite Observation Systems and Related U.S. Space Technology* (RAND, 1988), 19–21.
148. Philip Taubman, *Secret Empire: Eisenhower, the CIA, and the Hidden Story of America's Space Espionage* (Simon and Schuster, 2003), 179–80; Jonathan M. House, *A Military History of the Cold War 1944–1962* (University of Oklahoma Press, 2012), 394; and Burrows, *By Any Means Necessary*, 207.
149. Curtis Peebles, *Shadow Flights: America's Secret Air War Against the Soviet Union* (Presidio Press, 2000), 108.
150. Harold E. Mitchell oral history, interview by Robert D. Mulcahy, Air Force Space and Missile Systems Center History Office, October 1, 2003, transcript, 5–7.
151. Burrows, *By Any Means Necessary*, 207–8.
152. Taubman, *Secret Empire*, 179–83; and Peebles, *Shadow Flights*, 122–23.
153. Davies and Harris, *RAND's Role in the Evolution of Balloon and Satellite Observation Systems*, 60–61.
154. Burrows, *By Any Means Necessary*, 212.
155. CIA U-2 history, 89.
156. Reel, *A Brotherhood of Spies*, 85–86.
157. NACA Press Release, May 7, 1956, quoted in Johnson, *More Than My Share*, 118–19.
158. NACA Press Release, May 9, 1956, quoted in Johnson, *More Than My Share*, 120.
159. Burrows, *By Any Means Necessary*, 233; and Killian *Sputnik, Scientists, and Eisenhower*, 84.

160. Dwight D. Eisenhower, *Waging Peace 1956–1961: the White House Years* (Doubleday and Company, 1965), 483.

161. Taubman, *Secret Empire*, 179–83; and Peebles, *Shadow Flights*, 122–23.

162. Bissell, "Origins of the U-2," 21.

163. Schell, "The SA-2 and U-2: Secrets Revealed," 34–35.

164. Ritland oral history, 141, 227–28.

165. CIA U-2 History, 321–22.

166. Burrows, *By Any Means Necessary*, 239.

167. Ritland oral history, 145–46.

168. Gen Bernard A. Schriever, "Military Space Activities: Recollections and Observations," in *The U.S. Air Force in Space: 1945 to the Twenty-first Century*, ed. R. Cargill Hall and Jacob Neufeld (USAF History and Museums Program, 1998), 15.

169. Jacob Neufeld, "Bernard A. Schriever: Challenging the Unknown," in *Makers of the United States Air Force*, ed. John L. Frisbee (Office of Air Force History, 1987), 295.

170. Ritland oral history, 147.

171. Quoted in Neufeld, "Bernard A. Schriever," 291.

172. Unknown officer quoted in Neufeld, "Bernard A. Schriever," 288.

173. Putt oral history, 243.

174. Ritland to Johnson, unsigned copy of a letter, March 30, 1956, Ritland papers.

175. Johnson to Ritland, letter, April 10, 1956, Ritland papers. Emphasis in the original. Note that Johnson spelled Ritland's nickname as "Ossie."

176. For more on the shootdown and the crash, see John A. Schell, "The SA-2 and the U-2: The Rest of the Story," *Journal of the Air Force Historical Foundation* 70, no. 2 (2023): 37–46.

177. Eisenhower, *Waging Peace*, 545–52. Despite the shootdown, Ike said in his memoirs that he knew "of no decision that I would make differently, given the same set of facts as they confronted us at the time. I deeply regret that one of our young pilots had to pay with imprisonment for the failure of his plane in its final flight over Russia. [But t]echnically, the entire program was a success. The information acquired did much in influencing the size and character of our security structure, in revealing the pattern of Soviet industrialization, and in locating military establishments of greatest threat to us in the Soviet Union. Armed with U-2 knowledge, which supplemented the strength of our Armed Forces, we were better able to plan our own political-military course" (558).

178. Schriever read the letter from Bissell, who was at the dinner, Ritland farewell dinner, 27-minute mark.

179. Schriever read the letter from Johnson, who was not at the dinner, Ritland farewell dinner, 28-minute mark.

Chapter 6

Flying Missiles

In late 1958, Convair, prime contractor for the Atlas ICBM, proposed launching a satellite using the missile as a satellite booster. On board would be SCORE, for Signal Communications by Orbiting Relay Equipment. Carrying a Christmas greeting from President Eisenhower, SCORE was essentially the first purpose-built communications satellite, although it was little more than a tape-recorded message broadcast to Earth from space. (The first real-time, active communications satellite we would recognize today was Telstar I, AT&T's 1962 satellite.) Nevertheless, Ritland recalled, the project was "kind of a little propaganda that an Atlas ICBM could put up a satellite around the earth."[1] (Recall points made about Sputnik that if you could orbit a satellite with a launch vehicle, you could lob a nuke with one, too.) The Army and the Navy had had several successful launches in 1958. SCORE was the Air Force's chance to catch up in the domestic space race.

Ritland was at Patrick AFB in Florida for the launch on December 18, 1958. The night before, engineers duplicated the President's message into SCORE's tape recorder, but the team from Space Technology Laboratories did not tell the technicians in the launch site blockhouse or in range safety that they had, Ritland said, "cranked into the GE guidance system the orbital parameters of [a] space launch" instead of an ICBM test trajectory. When the rocket lifted off successfully, a point of pride for everyone in the Atlas program, "it just kept going and going—everybody didn't understand it—and the range safety officer was about ready to push the button" to destroy the rocket. But Air Force Missile Test Center Maj Gen Donald Yates stopped the officer from hitting the destruct button and the satellite went into orbit.[2] The satellite was about 100 lbs., developed using commercial-off-the-shelf equipment in about six months. It had two redundant sets of equipment mounted in the nose cone of the Atlas, including four antennas mounted flush to the surface of the missile, two each for reception and transmission. The two tape recorders each had a four-minute capacity to store and play back, based on commands from the four US-based ground stations.[3]

SCORE's flight aboard the 70-foot-tall, four-ton, Atlas 10B from Cape Canaveral's Launch Complex 11 was the US Air Force's first spacelift mission, albeit of an originally Army satellite that was just a boosting of an entire rocket into space without the payload separation that is generally associated with launching satellites, but it had gone off without a hitch. The onboard VHF radio transmitter broadcast Ike's Christmas message of peace to a worldwide audience, the first voice to be transmitted to the Earth from space:[4] "This is the President of the United States speaking. Through the marvels of scientific advance, my voice is coming to you from a satellite circling in outer space. My message is a simple one. Through this unique means, I convey to you and all mankind America's wish for peace on Earth and good will toward men everywhere."[5]

A week later, the first graders of room 3 at Carew Street School in Springfield, Massachusetts, sent Ike a message that they had heard his message and proclaimed they were "very happy for our country. We are going to travel through space when we get older."[6]

Despite a little wobble in the rocket's course, the SCORE satellite's success showed that "here you had a standard Atlas ballistic missile capable of launching a satellite which tended to improve the credibility of the Atlas missile program," Ritland said.[7] Fourteen months after the Soviets launched their first satellite, the United States demonstrated that it could easily keep up with the Soviet space program. Recalled Ritland later, "We were never requested, nor did we ever propose, ever, to do a political launching, at that time, with the exception of the so-called Score launching when President Eisenhower's Christmas message was relayed to everyone. That indeed was political."[8]

Perhaps just as significantly, the military was also able to use the SCORE satellite to send "the first successful relay of teletypewriter signals through an orbiting relay station." Sending Ike's Christmas message from a tracking station outside Los Angeles to a receiving station in Texas demonstrated a technique that a newspaper predicted, correctly as it turned out, "would be a more likely medium of military communication than the spoken word."[9]

Scientists and engineers told newspapers that “the Atlas’ achievement went far beyond the simple matter of bulk. A highly-developed guidance system enabled the rocket to get into orbit by a new technique. And the two-way radio equipment it contained gave promise of revolutionizing wireless communications.”[10] The vehicle’s batteries failed after eight hours but the secondary mission of the program—to demonstrate the practicality of space-based store and forward communications relay—had been accomplished.[11]

About a month later, the rocket body reentered the atmosphere and burned up over the Pacific Ocean. A few months later, on September 9, 1959, SAC commander-in-chief Gen Thomas S. Power declared the Atlas D ICBM to be an operational weapons system part of the US nuclear deterrent. The same day as Power’s announcement, a modified Atlas D missile successfully launched an uncrewed prototype of a NASA Mercury capsule.[12]

There was now, according to one Washington newspaper, “real conviction that the so-called gap between the United States and Soviet Union on long-range missiles and satellites, however wide or narrow it may have been, has been effectively closed. The reason for this optimism is found in large measure in the successful development of the Thor and Jupiter 1,500-mile ballistic missiles, progress on the Atlas and five successful satellite launchings.” Said Rear Adm John E. Clark, deputy director of DOD’s Advanced Research Projects Agency (DARPA), “We’re definitely not trailing the Russians in the missile business.” The United States, on the backs of the Army and Air Force missile programs, had caught up to the Russians in the “rocketry and space race” even if it was not always such a close-run thing.[13] Once again Ritland was the engineer who solved the problem.

American engineer Robert Goddard had been the first person to successfully launch a liquid-fueled rocket in 1926, but his work was largely ignored at home. German engineers, though, did not ignore him and poured what they could get from the United States in the 1930s into a missile program of their own, eventually resulting in Wernher von Braun’s V-2 ballistic missile that killed thousands of slave laborers during the construction of the missile and many others when it became operational in 1943. Before the war officially ended, the Allies raced to capture as many of von Braun’s rocket team as they could by launching an operation to get to the V-2 factory in Germany and extract at least enough parts to build 100 V-2s before the area was turned over to the Soviets. During Operation Paperclip, von Braun and many of his team made it to the United States where they went to work for the US Army, first reassembling and test-launching V-2 rockets and then working on other rocket programs for NASA, including the Redstone and Jupiter launchers and the Saturn V Moon rocket.[14]

Schriever, though, gave credit not for technological know-how but for a vision of the future to a different leader: "At the end of World War II, General Arnold, who was my mentor and certainly was the most visionary Air Force officer that we had up to then and, as far as I'm concerned, in the history of the Air Force, he said that, 'The next war will not be like the last one. World War I was won by brawn, in the trenches. World War II was won by logistics,' and I can vouch for that, because I spent almost three and a half years in the Pacific [Theater], and logistics was very, very important in winning that war, as well as other aspects. 'World War [III],' he said, 'will be won by brains,' and he went on further to say that the breakthroughs that really occur, that are most important, were electronics, flow of information—the jet propulsion, rocket propulsion."[15]

Schriever was correct about Arnold's strategic vision for the future of technology and its likely impact on the air service. Arnold had cultivated relationships with academics and industry for years and knew the future of many technologies, like the changes coming in propulsion, for example. He had known the Jet Propulsion Laboratory's Theodore von Kármán for many years and tasked him to lead the Scientific Advisory Group, speculating about whether the airplane might even be obsolete. "Are manless remote-controlled radar or television-assisted precision military rockets or multiple purpose seekers a possibility?" Arnold asked von Kármán to investigate this and other possibilities. The subsequent report, called *Toward New Horizons*, became the blueprint for the future technological bent of the new Air Force, including its new research and development command.[16]

It was not just Arnold and von Kármán who were thinking these big thoughts, though. In April 1946, Army Chief of Staff Gen Dwight Eisenhower issued a memorandum to the service titled "Scientific and Technological Resources as Military Assets," arguing that the military alone did not win World War II. "Scientists and business men contributed techniques and weapons which enabled us to outwit and overwhelm the enemy. Their understanding of the Army's needs made possible the highest degree of cooperation. This pattern of integration must be translated into a peacetime counterpart which will not merely familiarize the Army with the progress made in science and industry, but draw into our planning for national security all the civilian resources which can contribute to the defense of the country."[17] In a speech to the National Security Industrial Association in 1986, Schriever remembered that Arnold called him into his Pentagon office 40 years before, in January 1946, and tasked Schriever with establishing "a close and continuing relationship with the scientific community and industry," efforts that eventually became the Scientific Advisory Board, the R&D Board, and the RAND Corporation.[18]

Also in April 1946, after asking the aircraft industry for their thoughts, the AAF awarded Convair a contract to study the development of a "supersonic, ballistic, and rocket-powered" missile. Program MX-774 took very much the same approach as R&D of aircraft. Using the captured V-2 technology tested at White Sands Proving Grounds in New Mexico, the eventual result was the Atlas ICBM. But there were a lot of twists and turns to go. With the postwar drawdown, money for research projects was cut back. Ritland saw that at Wright Field, where after the huge strides made during World War II in aircraft capabilities, almost no new airplanes were coming off the drawing boards in the 1940s. The same was true for missile programs, to say nothing of space programs. The air service cancelled MX-774 in favor of the winged, air-breathing, airplane-like missiles, which used the airplane-like designators XB-62 for Snark, XB-64 for Navaho, and XB-65 for Atlas.[19]

The military services, meanwhile, argued in the austere budget environment over which one would get which weapon system to develop. They eventually settled on the Army and Navy getting air defense artillery systems and shorter-range rocket systems, the Air Force and the Navy getting surface to air missiles, and the Air Force getting long-range nuclear missiles because they had the long-range, strategic nuclear bombing mission at the time. But the USAF had 18 missile projects underway in 1947, all starved for funds.[20]

The North Korean invasion of the South in June 1950 changed this trajectory as more funds became available for everything, especially R&D. With intelligence coming in that the USSR had its own missile program that was developing a capability that could threaten the United States or American bombers, the USAF let another contract for missile development, now called MX-1593, with a program name of Atlas. By 1953, DOD had 28 guided missile programs. Then the armistice in Korea in 1953 slowed everything down again. But it had already become obvious to many that the United States faced “an enemy who recognizes no law but superior force,” as Ritland told the California Federation of Women’s Clubs in May 1958.[21]

Many who wore Air Force uniforms opposed the ICBM, and appropriations were generally reprogrammed to support airplane programs of the air service. But the civilian leadership of the service and the nation knew about missiles and supported the systems Schriever was building and, working with Congress, began to get dedicated funding for ICBMs. SAC commander LeMay was “skeptical” about ICBMs and saw them initially as “penetration aids” for USAF bombers and “political and psychological weapons.” In Ritland’s interactions with LeMay, he knew “LeMay didn’t agree with it; he didn’t like it at all. I had personal conversations with him from time to time, and he didn’t support the program. I don’t know how he felt about it in later years; but I know in the earlier days he did not support it.” But Vice Chief of Staff Gen Thomas White, who one observer recalled “lectured the Air Staff on missiles—they were here to stay, he told them, and the Air Staff had better realize this fact and get on with it,” gave the Atlas ICBM the highest Air Force development priority.[22] LeMay did eventually come around to embracing ICBMs because they enhanced SAC’s capabilities.

In 1953 there was a new presidential administration that wanted to take a “New Look” into US defense programs. The Eisenhower administration was fiscally conservative and sought ways to get “more bang for the buck.” That capability was going to come from ICBM programs, which gained a new champion in Special Assistant to the Secretary of the Air Force for R&D Trevor Gardner. He ordered studies of missiles, eventually resulting in the report of the "Teapot" committee. The group recommended in February 1954 that the USAF put more money into the Atlas program and accelerate its deployment to 1960 to meet the president's goal of reducing overall defense costs and to compete with expected developments in the USSR. Gardner also proposed the creation of a new organizational approach to missile R&D.[23]

Gardner saw an urgent need to develop operational ICBMs. He convinced the Chief of Staff, Gen Nathan Twining, and Air Force Secretary, Harold Talbott, to set up an organization to pursue ICBM production. Gardner asked Schriever, shortly after the latter's selection for brigadier general, to move to Los Angeles to get the missiles built. In a former parochial school in Inglewood, California, Schriever established the Western Development Division. He also had the title "Assistant to the Commander" of Air Research and Development Command (who at the time was then–Lieutenant General Power), giving Schriever the chance to "bypass much of the cumbersome bureaucracy." Power, uninterested in WDD's day-to-day operations, gave Schriever "considerable latitude."[24]

Schriever became director of the ICBM program in 1954 after being around R&D programs in the Pentagon for some time. Historian Jacob Neufeld assessed the ICBM program to that point, however, as having "suffered through a checkered history marked by stop-and-go development, unrealistic requirements, divided authority, low priorities, and indecision whether emphasis should be on ballistic missiles or winged missiles like the Snark and Navaho, [which were] essentially unpiloted aircraft."[25] But the year before, Schriever had learned of the smaller, more powerful thermonuclear (hydrogen) bomb the United States was testing, which, though lighter, was much more powerful than the atomic weapons used in the war. He became convinced that ICBMs were now possible because the missiles required to carry them could be less powerful and less accurate because the bombs had "greater destructive power."[26]

Although ICBM programs were the "Air Force's highest priority" and Gardner was advocating President Eisenhower give the ICBM a top national priority, Ike decided to give his blessing to both the ICBM and intermediate range ballistic missile (IRBM) programs then underway. (Thor was the Air Force IRBM and Jupiter was the Army's and Navy's joint IRBM program.) Indeed, the ICBM program was not on the fast track to success. The mercurial Gardner resigned from his position to launch "a public campaign to warn the President and the American people of the urgent need to overtake Soviet technological progress."[27] Said Ritland, "the only people that supported the [missile] program were those that were assigned to it and understood it, and participated in the earlier days. Most of the people, and my friends in Washington, didn't understand it and opposed it. As a matter of fact, in my first assignment, I'll have to admit that I didn't clearly understand the program. It took me quite a while to realize just exactly what I was involved with."[28]

But Schriever had an organization that was much more than a special project office like an aircraft system project office at Wright Field. WDD was "a major weapons development center," according to Ritland. When he arrived in LA in 1956 to be Schriever's deputy, there was no hardware, only paper rockets, versions of the Atlas, Titan, and Thor missiles that would become so important to deterrence. In 1974, Ritland remembered Schriever as "an extremely competent individual, very aggressive, very smart, and very positive, and he accomplished, in my opinion, a tremendous job under, I'd say, adverse conditions. Mainly, he wasn't supported by the masses in the Air Force at all, the Air Staff, or anyone particularly. There were a very few senior people that supported him."[29] Despite opposition from within the flying community of the Air Force and from Congress, which was loathe to spend as much as was being requested, the missile programs eventually moved forward by using concurrency to speed up design and construction of not just missiles but the total weapon system.[30] Space programs, even a less popular idea than ICBMs, remained in limbo. Said Ritland later, "We had a family of ballistic missiles that used every technology that we knew of at the time."[31] That family included "the Atlas and Titan ICBMs, the Thor IRBM, and . . . the WS-117L reconnaissance satellite," though it was still very much a paper satellite.[32]

It quickly became obvious to Ritland, as it had to senior American leaders, that the Soviets were making progress in ballistic missiles and the United States "had to do something."[33] Said Ritland in a 1958 speech to the National Security Industrial Association, "By

1960, Russia will be capable of blasting America with thermonuclear bombs equivalent to two billion tons of TNT. This capability will be composed of aircraft and some limited number of ballistic missiles. The death toll in United States would be estimated at eighty-two million; an additional twenty-four million would be seriously injured [of the 174 million Americans in 1958]. These are the grim facts of life in the age of the hydrogen bomb, the ICBM's, [sic] and thirty minutes of flight time. . . . In short, our capability must counter all Russian possibilities to strike."[34]

Col Charles Terhune had technical responsibility for the missile programs in California while Ritland "handled the beginnings of the space effort" and served as Schriever's deputy. Terhune, who had engineering degrees from Purdue University and Cal Tech, was a test pilot who had served with Ritland at Wright Field and was one of the first to join Schriever's team in Los Angeles when the Western Development Division stood up in 1954. He would go on to earn three stars and after retirement served as the deputy director of the Jet Propulsion Laboratory.[35] But although "the space effort was small at that time, it was just beginning to grow and was becoming more and more" robust, and Ritland, in addition to running WDD when Schriever was on the road, had space programs to worry about.[36]

The missile group study had determined that while an ICBM was feasible, in Ritland's words, "there was not a single contractor in the United States that had the total technical capability for all of the disciplines to build an effective ballistic missile, an ICBM." Several contractors had capabilities in certain technical areas like guidance or propulsion or reentry, but none of them had all the needed expertise. Schriever's team decided the way to achieve an ICBM capability the fastest was to have a management organization that could integrate all the systems into the missile. Convair, part of General Dynamics, built the frame of the missile and assembled the parts but had no responsibility for the technical integration, which was the responsibility of the WDD program office in Inglewood, California. Convair did not have responsibility for the guidance systems or the reentry vehicle.[37] WDD did the technical integration and, through the system engineering and technical direction meetings, ensured that the contractor complied with the technical integration requirements.[38]

Concurrency is often criticized for being too expensive relative to the speed of system development. Recalled Ritland, "We were designing the operational environment along with the vehicles, the warhead, and the total weapons system all at once and together on a lead-time basis so that everything would fall into place." General Doolittle recalled concurrency as developing systems in parallel and putting "the amount of money on each one of these unknown things, relatively unknown things, that would permit them all to be ready at a given time. This greatly shortened the time required and was probably the one thing that brought our missile program into actual operational use as rapidly as I think it was possible to do. Now, Benny Schriever was largely responsible for that concept, for working on that concept and the final implementation of it."[39]

Ritland compared the concurrency concept to his test pilot days during World War II: "It's like we've always done in the past—we never built just one kind of fighter; we built two of them and made comparisons."[40] And he also described the U-2 "as the closest, in my experience" to a concurrent program: "Namely, from the day of the first meeting in December 1954, the estimate of completion and operational date was identified; the locations of operations were not quite identified, but within a few months the locations of operations were identified; and actually a facility that was never used in England was ready, operationally ready, to receive the aircraft and operate before we were ready to send them there. . . . This is a much smaller example of concurrency vis-à-vis the missile program."[41] Later Ritland wrote that "as we see it, some of the fundamental principles that must be observed are the following: clear-cut, vertical, and short management channels; a high degree of authority, delegated to the lowest possible operating management level; and centralized management responsibility for all essential elements of a program."[42]

When Ritland arrived at the Inglewood headquarters, a control room was set up that had "a big board of all the programs that were approved, and they had these key milestone dates clear on out to launch the missiles and operational deployment and everything of the whole program." Designers and operators wanted the missile systems to be like an airplane: They wanted the same accuracy, presumed missiles would be kept outside like airplanes were, and assumed missiles would have to be fueled all the time to have the same readiness as airplanes. The first piece of hardware he saw was just a black box alongside the paper plans for the missile "and I just couldn't see how we could ever get there from here, because it was only a short period of two or three years. I said, 'My goodness, if you're here today, how can you ever get a pad down in Florida and get all of this stuff to Florida and fueled and launched?'" As he looked at the big board, he saw not one missile program but several, including Thor, Atlas, Titan, and Minuteman.[43]

This so-called development-management concept, also called parallel development, was a different approach than the aircraft industry used, in which they contracted with the military for an aircraft that the manufacturer developed and delivered, like Ritland had experienced during World War II or when he worked on the U-2 program. In that cycle, R&D proceeded until the aircraft was ready for production and eventually reached the operational inventory. The support systems like airfields and command and control (C2) did not have to also be built because they were already there. In this new concept for ICBMs, R&D and production overlapped, reaching interim operational capabilities as milestones until a final system was fully operational, in part because support systems like launch sites and C2 systems did not exist and had also to be designed and manufactured. The Atlas system was more than just procuring missiles; it required the launch sites and C2 systems to control them so that if ordered to launch by the president, they could be commanded to do so. In parallel development, the USAF could work on multiple missile programs simultaneously by hiring contractors for individual subsystems like engines or rocket bodies and then using an integration contractor to get the subsystems to work as a single system. Titan was, therefore, not a backup missile to the Atlas program but an "alternate ICBM" in Ritland's "family of missiles." And in fact, the USAF contracted with Convair for the Atlas ICBM and with Martin Aircraft for the Titan ICBM. Douglas Aircraft had the Thor IRBM contract.[44]

The first problems they had to overcome were related to precision, reliability, and diligence. People just did not understand what it took to successfully fly a missile, Ritland felt. The *biggest* of the problems was propulsion, though, because engineers had never handled that kind of power, heat, and energy all together. Some of the failures they "had were, well, in hindsight they were just terrible," he recalled. They also had a lack of propulsion problem, that is, not enough range in the missile to hit its target. The early Atlas missiles only had a 2,500-mile range, but it needed to be twice that to get to the USSR. So, they had to sit down and figure out how to get more fuel on board, or more thrust from the engine, or how to make the rocket lighter overall, which meant it could fly farther. For example, on the Atlas, they decreased the thickness of the missile's aluminum skin and used the internal fuel tanks to keep it rigid for launch, but that meant they had to store the missile lying down because with empty fuel tanks, a standing Atlas would collapse under its own weight.[45]

The multiple missile program approach was expensive and got more so when multiple military services were working on missiles, as the three services were at the time. The Army's Jupiter IRBM was the farthest along, having evolved from the V-2 missile. Next was the Air Force's Thor and then the Navy's Polaris, which was supposed to be solid fueled, a technology following a little further behind liquid-fueled engines. Ritland recalled the period as

> a very difficult time. I don't think it hurt anything from the national development point of view. It cost us money because there was a duplication of efforts, especially between the Thor and the Jupiter, and I think in hindsight, everyone knows that either one of them could do the job with enough money. But the question was who was going to get the money and who was going to win out from a role and mission point of view. It was a real deadly argument and I was kind of in the middle between Schriever and Medaris [Gen John B., USA]. . . . [The missile programs] both had all of these deficiencies so that the programs, from a strategic point of view, weren't quite as important. However, the personalities involved were vicious, and man, it was a real knock down drag-out battle of who was going to win. . . . I know that Schriever, one night at his house . . . made an announcement to a few of us and he said, "Ozzie, I'm going to go after that Jupiter." Namely, he

> was going to attack the duplication of effort between the Army and the Air Force, and that he was going to win that battle. From that moment on, he worked on it with the press and with politicians in Washington. And of course, as you know, the program, the Thor, did in fact win out, but not because of any technical capability, because the Jupiter was performing equally as well . . . . [T]he Polaris program did not seem quite as competitive to the ballistic missile program the Air Force was pursuing because of the submarine aspects of it. However, from a comparative strategic weapons system point of view and the value of both of them, they were indeed tremendously competitive and we used to work like the devil on figures and facts and alternatives and tradeoffs and comparative studies to shoot down the Polaris program.[46]

Solving problems could be tough. Sometimes it would be an obvious issue like a liquid oxygen valve stuck open, pouring fuel into the combustion chamber. But other times it would be more difficult, as when they experienced five consecutive launch failures, not all from the same issue. "Of course," Ritland recalled, "we geared up and worked 24 hours a day on all of this business. Progressively, we thought we'd get something fixed, and we'd launch another missile and it would fail, but it wouldn't be the same failure." In another instance, a "tiger team" took a look at a failure and made some recommendations: "We made several corrections, changing the valves, some guidance changes, some propulsion changes, vent-valve changes. I can't recall all of those changes now, but I think we made about five or six changes and then started flying again. From then on, the missiles worked. What we did to fix the problem, we don't know precisely, but of the five or six things we did, they fixed it."[47]

The Thor IRBM was a simpler missile that did not require intercontinental range, so Inglewood could get the missile fielded sooner. On one trip to DC, Ritland briefed Secretary of Defense Charles Wilson and British Minister of Aviation Duncan Sandys on the Thor concept. The missile, which only had a 1,300–1,500-mile range, needed basing closer to the USSR than ICBMs did. Ritland gave their "canned" briefing on the Thor and Atlas, showing the similarities and differences between the missiles. He remembered it as "a very relaxed presentation" and said at one point, "So now then, you can see the Thor IRBM just falls out of the Atlas program without any new development other than the AC Spark Plug inertial guidance system." Wilson responded, "Yes, it fell out, but it sure cost an awful lot of money." At the meeting, though, Sandys agreed to the deployment of Thor missiles to England (where they were operational until the UK returned the missiles to the United States in 1963).[48]

By the end of 1959, the first Thor IRBMs were in England and the first Atlas ICBMs were on alert at Vandenberg AFB. Thor had taken only three and a half years from program approval to its initial operational capability; Atlas had taken a little over five years. By contrast, the Snark missile took 14 years to develop, the B-47 had taken eight years, the B-52 9.5 years, and the B-58 over 11 years. Navaho was never operational and was canceled after close to a decade of development because the ICBM programs had rendered it obsolete.[49] By the Cuban Missile Crisis in October 1962, the first 10 solid-fueled Minuteman ICBMs were operational, giving President Kennedy what he called his "ace in the hole" in the nuclear stare-down with the Soviet Union.

The Army's Camp Cooke, on California's central coast and today known as Vandenberg Space Force Base, is an ideal location for rocket launches. Located almost halfway between Los Angeles and San Francisco, it juts out into the Pacific Ocean about 20 miles, just far enough that in southern-oriented launches, early rocket stages fall into the ocean instead of onto land. According to Lockheed's Robert Salter, their Corona reconnaissance satellite proposal originated the requirement for launch facilities at Camp Cooke, "which Schriever liked because he wanted something up there. He received that with open arms."[50] Ritland recalled later, "Obviously, in hindsight, you can see that it was because it's the only place that you could get real good polar orbit launching capabilities; that was part of the requirements, plus operational combat training launches for SAC personnel."[51]

At a Pentagon briefing in the summer of 1956, Ritland introduced WDD's command briefer, Maj Roy Ferguson. Schriever had sent Ritland and Ferguson to brief Secretary of the Air Force Donald A. Quarles and Chief Twining on the need to transfer Camp Cooke to the Air Force for the ballistic missile program.

Also present were Vice Chief Thomas D. White and Lt Gen Tommy Power, then ARDC boss, and Maj Gen John McConnell, SAC's director of plans. Ferguson briefed about the need to use Cooke as a training base, but it was not going well, he could see, so he tried a different tack and began talking about the base's unique location and its value for missile launchings, which caused Ritland's eyes to grow "large in surprise." Schriever had told them not to say anything about missile launchings, which Schriever was afraid would nix the deal because Quarles's penny-pinching tendencies would find no favor in launching missiles. Ferguson said nothing about reconnaissance satellites because it "was such a closely guarded secret then." White, well-versed in the ways of diplomatic intrigue, began "to steer the meeting where he wanted it to go" by asking questions related to Cooke's location, pointing out on the displayed maps that from Cooke you could hit "about anything you need covered," including China and the eastern USSR. Soon Quarles was convinced and after a brief discussion said to Ferguson, "Go home and tell Schriever he's got Camp Cooke." Ferguson told author Neil Sheehan that evening when he and Ritland got back to their hotel, "they stripped down to their underwear so that they could completely relax, called for a fifth of whiskey, and did not have a great deal left in the bottle when they ordered something to eat." Defense Secretary Charles Wilson formally transferred the 64,000 acres of Camp Cooke from the Army to the Air Force in November 1956. Two years later the Air Force renamed the camp in honor of second Air Force Chief of Staff Gen Hoyt Vandenberg, who had died nine months after his retirement at age 55.[52]

On May 9, 1957, on what a local reporter described as "a sandy, scrub covered plain overlooking the Pacific" Ocean, Ritland turned "a spadeful of dirt" to symbolize the beginning of "the first phase of construction for the free world's first ballistic missile training center and operational base," describing in a brief speech the work to be done "as a completely new concept in military activity." He talked about the pending construction of new "barracks, mess halls, chapels, the airfield, and other support facilities," which needed repair or modernization, and for the new ICBM facilities that needed to be built. Ritland estimated that by the end of 1958, just 18 months later, there would be thousands of new military personnel, construction workers, and missile technicians at the base, predicting "the total basic construction cost would [be] roughly in the vicinity of $100,000,000." And he expected that the missiles would eventually be able to generate more power than the Hoover Dam but that he hoped "this weapon will never have to be used."[53]

At Vandenberg AFB, missiles could be tested by launching them to the south or southwest without worrying that an errant rocket could threaten populated areas on the US West Coast. While the Corona reconnaissance satellite team was awaiting formal approval, the launch pads for the Thor IRBM were under construction as part of the requirements and operational training for SAC personnel who would eventually operate the Thor as a weapon system. Engineers oriented the pads for southern trajectories for polar launches, "which most people didn't even recognize or understand," Ritland recalled.[54] Any launches intended for orbit launched to the south could head for polar orbit, ideal for the first reconnaissance satellites, without passing over any land until Antarctica.

Minuteman, though, was to be the game changer for the US land-based deterrent, which so far had relied on airplane-carried nuclear weapons—which were expensive to build, operate, and maintain. In Ritland's words, Atlas was "the transition from winged vehicles to ballistic vehicles" because it overcame the guidance problems that had plagued "pilotless" aircraft for years by using ballistic trajectories to solve the problem of accuracy. The Air Force competed missile and aircraft systems against each other until the realization that they were complementary systems, not competitive. He argued the design of the Atlas system was still very much influenced by aircraft design, down to the warheads that were similar to aircraft warheads, with which he was very familiar, of course, and the desire for Atlas's accuracy to be the same or better than aircraft accuracies. Atlas was also designed to sit out in the open like crewed aircraft and to be ready for launch in the same way as aircraft, that is, fueled and "on alert." Airplanes were vulnerable to surprise attack; missiles, when dispersed into hardened silos, like Titan and Minuteman, were more survivable and so provided an added level of deterrence. But Titan was as manpower intensive as Atlas whereas Minuteman, which had "been reduced to a level of simplicity beyond our fondest dreams," required only a two-person launch crew for 10 missiles. And because Minuteman was a solid-fueled missile instead of the liquid-fueled Atlas or Titan, it was much more stable and could be produced in numbers to rival Nikita Khrushchev's "sausages." During the 1962 Cuban Missile Crisis, when Minuteman missiles at Montana's Malmstrom AFB first readied for launch on the president's order, Kennedy could act with confidence against the Soviets, knowing the new, survivable system a long way from Cuba was his "ace in the hole."[55]

The history of the ways big bureaucracies move the lines around on organizational charts can be dry, so we will not dwell on it here too much. But it is important to point out that when it came to Ritland's career, the moves that the Air Force made both enhanced and narrowed the scope of Ritland's responsibilities. For example, in 1957, the Air Force had redesignated Schriever's Western Development Division as the Air Force Ballistic Missile Division (AFBMD), enhancing its role in the public and especially the political and interservice spheres. Then in April 1959 Schriever left to command Air Research and Development Command (ARDC) as its new three-star boss, and Ritland took command of AFBMD. With the new command came a new rank; in July, the Air Force promoted Ritland to major general.

Schriever went to ARDC as its new three-star boss until he maneuvered the Air Force into creating a four-star command called Air Force Systems Command in 1961. On April 1, 1961, Schriever deactivated AFBMD and split the organization into the Ballistic Systems Division (BSD) and the Space Systems Division (SSD). Ritland became commander of the new SSD, and command of BSD went to Maj Gen Thomas P. Gerrity, and both reported to Schriever through Lt Gen Howell M. Estes Jr., AFSC Deputy Commander for Aerospace Systems.[56]

In January 1961, Roswell L. Gilpatric, who had been Truman's Undersecretary of the Air Force and a board member at the Aerospace Corporation, was now the Deputy Secretary of Defense. He "suggested that the Air Force might win the space mission if it straightened out" the relationship between Air Materiel Command and ARDC. Recalled Ritland, "I remember at the time that it just seemed like it would be impossible, politically, to make this change, and everybody that had any experience or lived in that environment over the years just didn't think you could ever stuff it down different people's throats." But when presented with a possibility of gaining the space systems money and effecting efficiencies in Air Force R&D and procurement, the Air Force made the changes quite quickly. "The amazing thing was that it seemed to go very smoothly," said Ritland. "Now there are a few people that opposed it probably, but within time, it became apparent that it was the right way to go."[57] In April 1961, a reorganization did occur when the Air Force renamed Air Materiel Command to Air Force Logistics Command and took the responsibility for weapon system acquisition from AMC, added it to the R&D tasks in ARDC, and gave it to a newly created Air Force Systems Command. Schriever received his fourth star and command of AFSC.

Ritland had issued a memo for all AFBMD personnel not long after he took over in 1959, paying "tribute to the fine spirit of teamwork and cooperation which has characterized all our personnel." He praised Schriever's leadership and the cooperation of the "closeknit military-scientific-industry team." He asked for a continued "devotion to duty and the dedication of all our people to the tasks at hand and to the future" in a "spirit of mutual cooperation which has marked all our associations."[58] It was time to get to work but there were a lot of causes for enthusiasm. Said Ritland, referencing the successes of the Discoverer II mission, "Our worst hurdles are past. We know now that we can put man in space, and we know how to do it." He cited the two-week mission that showed the Air Force could successfully orient a satellite in space. Humans in space needed stable platforms in which to work. "Discoverer II proved we can stop the tumbling. Now we can begin to hope we have the means for steering these things—and that is the key to man's flight to the moon."[59]

He clearly understood the consequences of failure. By 1960, the budget Ritland controlled was over $1 billion at a time when the US government's total expenditures were about $77 billion.[60] An official photo from the period shows Ritland surrounded by a "forest" of missiles included in AFBMD programs at the time, including no fewer than 15 rockets and two launch sites.[61] As Ritland told a Los Angeles gathering of the Institute of Radio Engineers, "We are well beyond the Buck Rogers era of science fiction. Space is with us—and we must get with it if we are to reap the advantages there for those who demonstrate the foresight and have the daring to seek them. The stakes in this space race are astronomical; the rewards can be enriching beyond imagination. The penalty for tardiness, indecision, or complacency can be equally vast."[62]

But Ritland was not just about pouring money into problems. The "missile gap" controversy of the 1960 presidential election gave the Air Force an opportunity to rush the Titan ICBM into operation and even expand its deployed numbers. Secretary Douglas asked AFBMD to investigate the possibility. It concluded that with an additional $168 million in fiscal 1961 and $229 million in fiscal 1962, they could field 15 squadrons of Titan ICBMs. But, according to historian Jacob Neufeld, "Ritland vetoed the idea," because, even though there would be greater funding, it would not compensate for the greater manning and training requirements required to add the additional Titans. Instead, Ritland recommended replacing two Atlas squadrons with two more advanced, accurate, and survivable advanced Titans.[63]

By the end of 1960, Ritland's ballistic missile team was in high-performing condition. Two Atlas ICBMs had flown over 9,000 miles in test flights, and another had flown with all-inertial guidance, a key to its accuracy. Titan ICBM tests included flights of more than 6,000 miles. Minuteman missiles were tested in their silo configuration, intended to make them more secure and a stronger deterrent than the Atlas system, and they were beginning to test the Minuteman in its road-mobile configuration. AFBMD turned over the Thor IRBM as a completed weapon system to Air Materiel Command and the Atlas launch sites were turned over to SAC. Ritland had also stood up three test wings at Patrick AFB and Vandenberg AFB for missile testing, and in Sunnyvale, California, for satellite operations.[64]

SCORE's launch on an Atlas ICBM had been just the beginning of achieving what capabilities satellite technology could provide. But the thinking about those possibilities had begun long before and there were a lot of problems to solve in a short amount of time.

Notes

1. Ritland oral history, 213.
2. Ritland oral history, 213–14.
3. Donald H. Martin, *Communications Satellites 1958–1995* (The Aerospace Corporation, 1996), 5.
4. Spires, *Beyond Horizons*, 138; David N. Spires, *Assured Access: A History of the US Air Force Space Launch Enterprise, 1945–2020* (Air University Press, 2022), 18, 144; and William Hines, "Projectile 3 Times Size of Sputnik," *The Washington Evening Star* (December 19, 1958), 1. SCORE had been an Army program that the Defense Department's Advanced Research Projects Agency (ARPA) reassigned to the Air Force in July 1958 (Spires, *Beyond Horizons*, 138, 286).
5. National Archives, "Merry Christmas from Space!" Pieces of History blog (December 19, 2012), https://prologue.blogs.archives.gov/, accessed October 3, 2022; and "Speeches," Satellite SCORE Goodwill message, audio recording, Eisenhower Library https://www.eisenhowerlibrary.gov/, accessed October 3, 2022. The brackets indicate the difference between the transcript posted on the National Archives blog and the audio recording on the Eisenhower Library website.
6. National Archives, "Merry Christmas from Space!"
7. Ritland oral history, 213–14, 219, 241.
8. Ritland oral history, 241.
9. "Typewriter Note Relayed Through Atlas," *The Washington Evening Star* (December 21, 1958), 1.
10. William Hines, "Projectile 3 Times Size of Sputnik," *The Washington Evening Star* (December 19, 1958), 1.
11. Martin, *Communications Satellites*, 5.
12. Spires, *Assured Access*, 37–38.
13. L. Edgar Prina, "Parity Seen With Russia in Space," *The Washington Evening Star* (December 19, 1958), 1.
14. Walter A. McDougall, *…the Heavens and the Earth: A Political History of the Space Age* (Johns Hopkins University Press, 1997, original copyright 1985), 42–45.
15. Bernard Schriever, oral history, Interviewed by Carol Butler, NASA Johnson Space Center Oral History Project, April 15, 1999, transcript, 1.
16. Arnold to von Kármán, 7 Nov. 1944, in *Architects of American Air Supremacy: Gen. Hap Arnold and Dr. Theodore von Kármán*, Dik A. Daso (Air University Press, 1997), 319; and Daso, *Architects of American Air Supremacy*, xix. See also Michael H. Gorn, *Harnessing the Genie: Science and Technology Forecasting for the Air Force, 1944–1986* (Office of Air Force History, 1988).
17. Dwight Eisenhower, Memorandum for Directors and Chiefs of War Department General and Special Staff Division and Bureaus and the Commanding Generals of the Major Commands, Subj: "Scientific and Technological Resources as Military Assets," April 30, 1946, Schriever papers, Box 170, Folder 2.
18. Schriever, address to the NDIA on receiving the 1986 James Forrestal Memorial Award, March 12, 1987, Schriever papers, Box 168, Folder 4.
19. Neufeld, *Ballistic Missiles*, 48–50, 85.
20. Neufeld, *Ballistic Missiles*, 53–56.
21. "Force Reds' Only Law, Clubs Told," *The Los Angeles Times* (May 16, 1958), A1.

22. LeMay quoted in Neufeld, *Ballistic Missiles*, 121; White quoted in Neufeld, *Ballistic Missiles*, 106, 343n28; and Ritland oral history, 149–50.

23. Neufeld, *Ballistic Missiles*, 95–108. There is a copy of the declassified Teapot Committee report in General Schriever's papers in the Library of Congress in Box 165, Folder 3.

24. Neufeld, *Makers*, 290. For more on General Power's contributions to the development of space technology, see Brent D. Ziarnick, "The Space Force's Revolutionary Commander: Thomas S. Power," chap. 5 in Arnold, *Space Force Pioneers*.

25. Neufeld, in *Makers*, 288.

26. Neufeld, in *Makers*, 288–89.

27. Neufeld, in *Makers*, 294.

28. Ritland oral history, 148.

29. Ritland oral history, 369–70.

30. Ritland oral history, 149–51.

31. Ritland oral history, 177.

32. Neufeld, *Ballistic Missiles*, 147.

33. Ritland oral history, 148.

34. Ritland, speech to National Security Industrial Association, April 28, 1958, 2, 7. The text is in all capital letters that I have standardized for clarity.

35. Hughes, *Rescuing Prometheus*, 102; and "Lieutenant General Charles H. Terhune Jr.," https://www.af.mil/, accessed August 24, 2022.

36. Ritland oral history, 174.

37. General Electric worked on the guidance system, and in those days, the Atomic Energy Commission had responsibility for the reentry vehicle.

38. Ritland oral history, 210–13.

39. Lt Gen James H. Doolittle, USAF, Retired, oral history, interview by E. M. Emme and W. D. Putnam, Washington, DC, April 21, 1969, 47, AFHRA, K239.0512-625.

40. Ritland oral history, 193.

41. Ritland oral history, 153–54.

42. Ritland, "Air Force Missiles," 578.

43. Ritland, speech to National Security Industrial Association, April 28, 1958, Part II, "Speech data," 2, Ritland papers; Ritland oral history, 185.

44. Schriever in *Ballistic Missile Report*, 30–39; and Neufeld, *Ballistic Missiles*, 119–31.

45. Ritland oral history, 186–90.

46. Ritland oral history, 159–61.

47. Ritland oral history, 190–91.

48. Ritland oral history, 205–6; and Neufeld, *Ballistic Missiles*, 232–33.

49. Neufeld, in *Makers*, 297.

50. Robert Salter, interview by Martin Collins and Joseph Tatarewicz, 29 July 1986 and 7 July 1987, transcript, 49, RAND Oral History Collection, National Air and Space Museum Archives, Suitland, MD (hereafter RAND /NASM), quoted in Arnold, *Spying from Space*, 38.

51. Ritland oral history, 238A.

52. Sheehan, *A Fiery Peace*, 380–86. For more on the bureaucratic back and forth over the use of North Vandenberg and the Navy's portion known as Point Arguello, see chap. 3 of Spires, *Assured Access*; and Jeffrey E. Geiger, *Camp Cooke and Vandenberg Air Force Base, 1941–1966: From Armor and*

Infantry training to Space and Missile Launches (McFarland and Company, 2014), 152–89.

53. John Mitchell, "Missile Launcher Is Dedicated," *Santa Maria Times* (May 9, 1957), 1; Ritland, quoted in Averam B. Bender, "From Tanks to Missiles: Camp Cooke/Cooke Air Force Base (California) 1941–1958," *Arizona and the West* 9, no. 3 (1967): 237–38; Gladwin Hill, "Missiles Facility Started on Coast," *The New York Times* (May 10, 1957), 13; "Ground Broken for Cooke Missile Base," *The Los Angeles Times* (May 10, 1957), B8; and Irving Stone, "Work Begins on First IRBM-ICBM Base," *Aviation Week* (May 27, 1957), 68. Dividing the site at the Santa Ynez River, the Air Force got 64,000 acres or about two-thirds of the original Camp Cooke, and the other 20,000 acres of the former Army tank training base were given to the Navy for a missile test facility called Naval Missile Facility, Point Arguello, which was also transferred to the Air Force in July 1964 (Bender, "From Tanks to Missiles," 233).

54. Ritland oral history, 238A.

55. Ritland, speech to National Security Industrial Association, April 28, 1958, Part II, "Speech data," 1–14; Greg Thielmann, "The Missile Gap Myth and Its Progeny," Arms Control Association, no date, https://www.armscontrol.org/, accessed May 10, 2023; and "341st Missile Wing," March 2023, https://www.malmstrom.af.mil/, accessed May 10, 2023. The NSIA's Director of Special Activities' praise prompted Schriever to tell Ritland, "I'd better turn over all speech making over to you" (Ritland papers).

56. National Archives, "AFBMD" (n.d.), https://catalog.archives.gov/, accessed October 4, 2022; and "Minimum Disruption Planned During Reorganization Program," *Astro News* 3:4 (April 26, 1961), 1.

57. Ritland oral history, 289.

58. Brig Gen O. J. Ritland, "Memorandum for All AFBMD Personnel," May 5, 1959, Ritland papers.

59. "Missile Command Goes to Dogged Gen. Ritland," *Washington Evening Star* (May 2, 1959), 3. Launched April 13, 1959, the satellite had a simulated biomedical payload that was ejected on orbit, but due to a bad separation timer, the capsule landed near Spitzbergen, Norway, where the Soviets recovered it.

60. Lt Gen Charles Terhune, oral history by Robert Mulcahey (June 6, 2001), 15, U.S. Space Force Systems Center Archives; and Dwight Eisenhower, "Annual Budget Message to the Congress: Fiscal Year 1960" (January 19, 1959), The American Presidency Project, University of California Santa Barbara, available from https://www.presidency.ucsb.edu/, accessed January 13, 2022.

61. Neufeld, *Ballistic Missiles*, 196.

62. O. J. Ritland, "Military Space Bid," Editorial, *Aviation Week* (February 22, 1960), 21. Excerpts from a speech to the Institute of Radio Engineers.

63. Neufeld, *Ballistic Missiles*, 194. The Atlas-F and Titan I squadrons were nine missiles each (Neufeld, 195).

64. "Significant AFBMD Accomplishments Highlight 1960," *Astro News* (January 25, 1961), 3.

Chapter 7

Flying Satellites

On August 19, 1960, Capt Harold Mitchell and his Fairchild C-119 Flying Boxcar crew reported to the ops shack at Hickam AFB, Hawaii, at 6 a.m. Briefing time for the flight that day was 7 a.m., but Mitchell knew that there were some issues with the left engine of his specially modified twin-engine cargo plane. When Mitchell walked in, his crew chief, Tech Sgt Louis Bannick, met him with a smile and Mitchell instantly knew tail number 51-8037 was ready to fly.[1] They briefed the mission on time with the other crews set to fly that day, including callsigns, aircraft positions, departure times, and codebooks, and then they handed out the padlocks for the shipping containers. Recalled one former engineer, "The aircrew briefings very simply were . . . 'You go to this place and you orbit one, two, three, four, five, six, seven, eight, nine C-119s. That's where you fly. When the space capsule comes down or doesn't come down, you look for it, then fly by and catch it. You reel the space capsule in. You put it in this tin can and lock it, carry it back to Hickam, and some guy will come and get it.' It was just that simple."[2] They were also told that day the Agena spacecraft was in an abnormal attitude and was burning fuel faster than expected, meaning the reentry vehicle might come down earlier or later than planned. Mitchell knew what was on board the spacecraft because he had been briefed on the classified aspects of the satellite system.[3]

At 9 a.m., Mitchell's C-119, whose callsign that day was Pelican 9, took off from Hickam to assume its orbit in the recovery pattern, which was about 300 miles southwest of Hickam well out over the Pacific Ocean. They climbed up to 16,000 feet and listened to the command post frequency on the radio. At 12:46 p.m., the command post controller announced that the capsule had ejected over Kodiak, Alaska, and was on its way in. Seven minutes later, navigator Bob Counts announced that he had a signal at a heading of 225 degrees, which was way out of the expected position. Mitchell pushed the speed up to 275 knots, just 15 knots short of the redline for the

C-119's twin engines, and initiated a 360-degree turn to check the signal. Counts confirmed it. 225 degrees. As Mitchell began a gradual descent, the controls felt a little stiff. But within a couple of minutes, they saw it 4,000 feet above them: an orange and silver parachute with a gold capsule below it the size of a kettle drum and gleaming in the sun.[4]

Slowing the C-119 to 120 knots, Mitchell opened the rear doors, and the crew extended the recovery rig out the back of the airplane. There was no other plane closer than 130 miles so they had to catch it or another capsule would hit the water and bring further questions about the aerial recovery techniques planned for the program. As the parachute and capsule passed through their altitude, Michell rolled the airplane over the chute to catch it in the rig out the back. He missed. He brought the C-119 around and tried a second pass, this time flying just two feet above the parachute. A deck of stratus clouds reaching up to 7,500 feet was just below them. Things were about to get tricky as they descended. Mitchell knew this could be the last pass before the bucket hit the water in what would be his second straight miss of the program. He rolled in on the parachute about 800 yards from it, watching the chute bobbing up and down and weaving a little left in the Pacific weather. He edged the plane down a little bit more as the parachute flashed below the belly of the fuselage. Mitchell felt a slight tug on the controls. In the back of the aircraft the recovery winch's drum released the cable attached to the loop and bronze hooks that ensnared the drogue parachute. Then the unraveling cable came to a stop.[5]

The call from SSgt Algaene Harmon, the chief pole operator, came right away. "Good hit, Captain! We've got her in tow!" Harmon reversed the winch and reeled the capsule into the back of the aircraft. The crew of Pelican 9 had just become the first "to catch a falling star."[6]

Mitchell radioed back to Hickam that they had recovered the spacecraft but was told to stay off the air because there was another crew attempting a recovery, a false one as it turned out. Mitchell had his copilot, Capt Richmond "Rick" Apaka, turn the plane back for Hickam while he went below to the cargo deck. He congratulated the crew and thanked them for the year of flight training that it took to get them to that point. Then Technical Sergeant Bannick pulled out a piece of orange nylon parachute from his flight suit. “For you, captain,” Bannick said, handing Mitchell the piece of cloth. “They will never miss it.”[7]

As Mitchell looked at the gold capsule in the dull, gray shipping container, he could see that soot from the retrorockets covered the capsule and under the soot were etched the names of the parachute packers. When he got back to the flight deck, they again radioed that Discoverer XIV was safely onboard Pelican 9 and they were heading back to Hickam. As they got closer, another three C-119s of the recovery force dropped into a tight diamond formation with Pelican 9 at the front, until the other three backed off as they lined up for landing. When Pelican 9 rolled to a stop, they were met by the commander of Pacific Air Forces, Gen Emmett “Rosey” O’Donnell, who, on the authority of the Chief of Staff of the Air Force, awarded Mitchell the Distinguished Flying Cross right then and there. The other members of the crew all received the Air Medal.[8] The space capsule was taken off the airplane and, according to Corona engineer Col Frank Buzard, “surreptitiously” sent to Lockheed’s secure facility where engineers opened the capsule, removed the film, and put the film in another container. A courier took the container to Rochester, New York, and delivered it to Eastman Kodak, which developed it.[9]

That evening, Mitchell and a couple of crew members headed for the mainland, landing at LAX at 7 the next morning, where Ritland met them at the airplane. He took the aircrew into the terminal for a press conference. The 35-year-old Bloomington, Illinois, native Mitchell described his crew of nine as operating “like a baseball team.” Lt Robert D. Counts, the navigator, “gets us to the ball park. But Sgt. Bannick, the winch operator, is the fisherman of the group,” Mitchell said, switching metaphors. “He has to reel it in.”[10] After that, they headed over to a secure area of the Ballistic Missile Division Headquarters where, Mitchell recalled, Ritland asked, “Isn’t it poetic justice that the first satellite with film taken over Russia should be recovered by the first pilot selected from the Genetrix project?”[11]

What the rest of the crew might not have known, but which Mitchell certainly did, was the importance of the gold bucket in their hold. This was not an aerial recovery of an American flag in a test chamber as had been the cargo for Discoverer XIII, which was successfully water-recovered just over a week before on August 10. In the Discoverer XIV “bucket” was the first film recovered from space from the first successful photoreconnaissance satellite mission, and on that film were pictures of 1,650,000 square miles of Soviet territory, more than all 24 U-2 flights combined, including some areas of the USSR never seen before by Western intelligence.[12] It is not hyperbole to say that a revolution in intelligence had just occurred with the recovery of Corona flight 14. With the new photos in hand, the CIA could release a new set of conclusions of Soviet military strength: “We now estimate that the present Soviet ICBM strength is in the range of 10–25 launchers from which missiles can be fired against the U.S., and that this force level will not increase markedly during the months ahead.” The missile gap was now officially a myth. More importantly, wrote historian Curtis Peebles, “the United States no longer had to estimate how many ICBMs the Soviets had, or guess where they might be located. The United States *knew*.”[13]

Ironically, or perhaps tragically given the delays in the Corona program might have prevented the U-2 shootdown and capture, Mitchell’s bucket catch occurred the same day the USSR sentenced reconnaissance pilot Francis Gary Powers to prison for aerial espionage using the plane shot down May 1, just 14 weeks earlier. Coincidentally (but certainly examples of all the space R&D going on at the time), the week of the Corona 14 recovery was the same week Maj Robert White flew the X-15 to 314,750 feet, or 59 miles, to the edge of space, and that Capt Joseph Kittinger jumped out of a balloon at 102,000 feet and parachuted to Earth, going faster than the speed of sound on his way down. It seemed like a new aviation or space record fell every week in the early 1960s, although few people would know about the record-setting Discoverer XIV’s true mission for decades.[14]

The aerial overflight programs like the U-2 and others had not been getting Presidents Truman or Eisenhower what they needed: a definitive understanding of what capabilities the Soviets had. Preventing a sneak attack like the 1941 Pearl Harbor attack was a major goal. Cameras in balloons did not provide answers. Cameras on high-altitude reconnaissance aircraft did not, either. So they went even higher, into space.

There were differences between the American and Soviet approaches to spacelift even in 1960. The USSR had a big rocket booster for its warhead. The US did not have a big rocket because the United States did not need one, having already managed to miniaturize its warheads to fit into B-52 bombers, sea-launched Polaris missiles, and its own ICBMs. The Soviets hadn't miniaturized their bomb yet, so they needed a big rocket, which is also better for putting satellites in orbit. The USSR also had Nikita Khrushchev, who put more emphasis on being first than President Eisenhower did. He used technology as much as possible to demonstrate through propaganda the advanced nature of the Soviet system. Ike wanted the US space program to appear less militarized than it already did. There was good propaganda value in tying the Soviet space program to their nuclear weapons program and the US space program to civilian scientists. The biggest rockets in the United States were Army and Air Force missiles intended to throw nuclear weapons long distances. The Army program also had ties to the Nazis through von Braun, so Ike chose a smaller rocket and satellite program that, although sponsored by the US Navy, had strong academic and scientific components.

Eisenhower was also trying to get the Soviets to buy off on the idea of the legality of overflight through space. It is a violation of international law to overfly another country without their permission. Because vast areas of the USSR were closed to Americans, much of what was going on was unknown and unobserved. By flying U-2 airplanes over the USSR, the US could learn about these denied areas, but each U-2 flight was legally a violation of Soviet airspace. When the Soviets proved they could shoot down a U-2, Ike ordered the flights stopped but still needed that information. Thus he encouraged the development of reconnaissance satellites, or "spy satellites." But he did not order their launch yet. After the Soviets launched Sputnik, it passed over the United States on multiple orbits around the earth. The United States did not protest this overflight of its territory without its permission.[15] A new precedent had been established in international law, the freedom to fly a satellite in space over any part of the globe at any time for any purpose. Ike quickly ordered the launch of the new spy satellites called Corona in late 1959. What followed (after 13 initial failures) was the collection in one mission of more pictures of the USSR than all the U-2 flights combined.

But still the United States did not push a space race. The president was a fiscal conservative who did not see the need for a large space program. Not long after Sputnik went into orbit, he was photographed playing golf. He did not see what a big deal it was. He also was not running for reelection in 1960. Richard Nixon, his vice president who was running to succeed him, lost in 1960 in part because they were not showing enough concern about these issues. The result of Ike's approach was that the military was not spending a lot of money and time on space programs. Schriever only had a few million dollars to spend on researching space systems technology and took that funding out of his ICBM development budgets. The Air Force was about airplanes, not satellites, and told Schriever not to bend any metal. Recalled one former military engineer, "I remember the direction came down. 'The word "space" is forbidden to be used. You will not even talk about it. Nobody is interested in space. It's a nonuseful type of endeavor for the military to get into. It's a waste of money, just don't talk about it.' We didn't quit thinking about it, but we quit talking about it."[16]

The Air Force had in fact been thinking about space systems since the Douglas Aircraft Corporation's Research and Development division (later the RAND Corporation) produced a report in 1946 suggesting a design and the use of a "World-Circling Spaceship" in response to the Air Force hearing the Navy was studying space programs.[17] Said Schriever, "So we were actually working on the idea of reconnaissance satellite starting back in the middle forties, after World War II. Here again, we were involved in technical planning, as well as some testing, but we, again, did not have the capability of putting anything into orbit at that time. But the interest was there and the thinking and the studies and the kind of technical research that we had always involved in programs of this type. So our interest was very high, starting at the end of World War II, for a reconnaissance satellite program, and we started on that as well, in the same manner as the missile itself."[18]

RAND pitched its ideas to Air Force personnel at Wright Field in 1946, Ritland recalled, which was when "Wright Field was the responsible agency for funding RAND and the studies and development of that concept."[19] Maj William G. King Jr., an engineer at Wright Field in the Snark missile program office, had read the RAND reports and convinced himself the military could do missions in space. King set up the official Advanced Reconnaissance Program System Program Office using $2 million to study the concept of military satellites.[20] Said Ritland later, RAND and the program office at Wright Field "didn't necessarily describe [satellites] as a weapon or a capability, but they pointed out that it was possible to develop the so-called earth satellite, meaning you could have something that would be launched and go around the earth. Then, progressively, they proposed that if you did have a vehicle orbiting the earth, it could indeed be a reconnaissance vehicle."[21] In 1956, the Air Force moved its satellite program, which was initially called Weapon System 117L, to Los Angeles where it could be developed alongside the rockets that would get the satellites into space but only allocated a few million dollars for research.[22]

Behind the scenes there was support for satellite programs by people with the vision to see what was possible. Later RAND reports suggested satellites could do several missions using satellites for meteorology and reconnaissance, and this second one became Project Feed Back in 1954 and eventually the world's first photoreconnaissance satellite.[23] An Air Force report from its Scientific Advisory Board (SAB) echoed support for space programs. In a May 1956 report, the SAB recommended "VIGOROUS SUPPORT AND EXPANSION" of the reconnaissance satellite program because "to launch a group of satellite vehicles and maintain them in orbits several hundred miles above the earth seems to all of us a great enterprise linked to the traditions of . . . the Wright Brothers' airplane. . . . The instrumented earth satellite is one of the most exciting adventures in the Air Force research and development program."[24] Less than two decades later, when President Kennedy pushed the United States to the Moon, it was with an understanding that space programs could capture the world's imagination and push the debate about capitalism versus communism in new directions.

Eisenhower had yet to decide which organization should have responsibility for space. In 1948, CSAF Vandenberg had issued a policy statement that staked the Air Force's claim for space operations: "The USAF, as the Service dealing primarily with air weapons—especially strategic—has logical responsibility for the satellite."[25] Air Force Chief of Staff Gen Thomas D. White echoed Vandenberg in a November 1957 speech: "In speaking of the control of air and the control of space, I want to stress that there is no division, per se, between air and space. Air and space are an indivisible field of operations. . . . Ninety-nine percent of the earth's atmosphere lies within 20 miles of the surface of the earth. It is quite obvious that we cannot control the air up to 20 miles and relinquish control of space above that altitude . . . and still survive."[26] In its 1959 official doctrine, the Air Force said,

> The aerospace is an operationally indivisible medium consisting of the total expanse beyond the earth's surface. The forces of the Air Force comprise a family of operating systems—air systems, ballistic missiles, and space vehicle systems. These are the fundamental aerospace forces of the nation. . . . That nation, or group of nations, which maintains predominance in the aerospace —not only its military forces but also in its sciences and technologies—will have the means to prevail in conflict.[27]

Thereafter, White frequently used the term "aerospace" to make his point that the Air Force should be the service for all military missions above the surface of the earth. The approach worked to keep space technologies in the discussions about how to spend but it still did not generate a lot of actual funding.

Ritland, too, contributed to this approach. For example, in a May 1959 speech in Denver, he argued that the military's "space exploration" was simply "based on our recognized need for superiority in space power, as an extension of air power. We consider space as only an extension of a medium in which we are already operating a deterrent power, and we know that superiority in space is a fundamental requirement for survival, and for maintaining the position, prestige, and welfare of the nation."[28] Thus by 1959, the Air Force had convinced itself that it should be the military's space service, but it had not convinced anyone else, especially not Ike. That was about to change.

When the SAB requested an update on where the nation's satellite capability stood, whether the country needed it, and its technical feasibility, Schriever charged Ritland with the responsibility of organizing a group to brief them.[29] He assembled a group for this purpose that included Col Frederic C. E. Oder, who "was then the program director of that effort, which was all paper and all study." But, recalled Ritland in 1974,

> we did indeed have subcontracts with the photographic people, technical hardware people, Lockheed and Eastman Kodak and electronic people. So we geared up a combination industry–Air Force team, predominantly industry-oriented, with very smart technical people that later on became deeply involved with this kind of effort, and went to the President's Scientific Advisory Board. We presented where we stood and recommended that we pursue this satellite system which was then identified as a "readout system." It meant that you would electronically read out—first of all, take a picture of the earth, process it, and electronically transmit it back to the earth in an electronic, readout capability.[30]

They were not yet interested in the operational requirements for such a system but "the name of the game was to prove the technical feasibility of it."[31] The board president asked for the team's recommendation, which was to pursue the readout satellite "on an urgency basis so that we could attain information on the Soviet capabilities which were of great concern at that time because of the 'missile gap.' " They went back to California, but nothing came of the suggestion.[32] Ritland took a similar but updated briefing before the SAB in mid-1957, again with no commitment except that the SAB was now convinced that a reconnaissance satellite was technically feasible. There had been no discussion of political, intelligence, or military requirements, only technical possibilities.[33]

Although he initially opposed space systems, LeMay eventually came around and wanted to use space programs "to augment terrestrial forces," using programs like "space-based communications to improve the reliability and scope of command-and-control systems." Other missions for the Air Force included weather observations for "target and refueling areas" and for "warning that a missile attack is under way." He also wanted the ability "to determine at all times whether there is a threat present, and to deal with it if necessary. To accomplish this, we have a requirement for an improved detection and tracking system, a means of inspecting unidentified Space devices, a means of disabling hostile satellites; and finally a system for continually monitoring such Space phenomena as radiation and solar flares—a capability that would be essential in supporting prolonged operations."[34]

Sputnik in October 1957 was the great game changer for US space programs. Recalled Ritland, "With that event, the Defense Department, the Secretary of the Air Force, everybody said, 'Say, what was that program you were trying to sell a few months ago in here? Come back in and tell us about it.' So then, after the fact, we went back in and began to tell them, informally."[35] Recalled Schriever many years later in an interview with the author, "When Sputnik went up . . . everybody was saying, 'Why the god dammed hell can't you go faster? Who's in charge here?' "[36] Of course, Schriever was in charge of Air Force space programs but, as mentioned, he was hamstrung by US policy.

For Ritland, though, US policy was limiting because its leading thinkers lacked vision. He said "the hysteria that was created by Sputnik was beyond comprehension when, in fact, if anyone had had the initiative, we'd have had a program. They didn't have the initiative to approve it at any level of government. I'm talking now of the very top level. The scientists, the big, responsible individuals in government didn't have the foresight, initiative, [or] desire to recommend to the President that we pursue such a program."[37] But, recalled Schriever, "Sputnik did one thing that was very much a plus: it woke us up and it concerned the American people very much that they beat us to the draw in getting the first satellite into orbit. . . . it stirred up a fury, so to speak, and a good one. We need to be awakened from time to time, and that really woke us up."[38] Said Ritland later, "When Sputnik went up, all hell broke loose because we were not very advanced in the space department. So the pressure was on; we were behind the eightball."[39]

Making things harder in the US at the time, though, was that although each military service had an interest in space, there was no comprehensive, national program. NASA's creation was still more than a year away in late 1958. At that point, the public face of the American space program could have been said to be Wernher von Braun's group in Huntsville, which was working on several possibilities. But, recalled Ritland, "they weren't oriented from a weapons system point of view or a collection system point of view or a necessity, from a national requirement.[40]

Recalled Eisenhower's scientific advisor James Killian, "The satellite by itself, I knew, did not constitute a weapon that could easily be turned against the United States. But the thrust that launched that satellite was another matter. The capacity to lift a satellite ninety or a hundred miles above the surface of the earth, and to place it into orbit, ominously suggested a capacity to lift a nuclear bomb into the upper atmosphere and send it hurtling down upon its target of choice. It was no secret that both countries were seeking that capacity. Sputnik was clear signal that the Russians were well on their way. But so were we."[41]

In February 1958, Killian and Land discussed with Ike the slow progress of the USAF's photoreconnaissance satellite known as the ARS, and then as Sentry. Ike agreed to give CIA responsibility for developing a film-return photoreconnaissance satellite. Fritz Oder, head of the Sentry program, had suggested Schriever bring in the CIA because Oder believed CIA funding would get the program moving. Oder also knew about the CIA-USAF relationship on the U-2 and that Ritland had been Bissell's deputy on the U-2.[42]

CIA money did get the program moving. In Los Angeles one day, Schriever, who knew about the U-2 program, called Ritland in to his office. Said Schriever, "I want you to go to Washington and set up a program with Dick Bissell on a new satellite system." So Ritland went to the offices in DC where he had worked on the U-2 program before, where the same secretary still worked, "and drafted up policy statements with regard to what the country would do with regard to starting this kind of effort."[43] Organizationally, the program was an "exact repetition of the U-2 operation," Ritland recalled.[44] The Air Force and CIA essentially repeated the same arrangement for the Corona program: Bissell was assigned to manage it through his Development Projects Staff and Ritland repeated his role as deputy to ensure the Air Force remained "a key player in the program."[45] He and Bissell drew up a couple of memoranda authorizing the program to begin, which ARPA issued to Schriever in California to begin working on the program. Bissell recalled how they arranged the management of the program:

> 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 so few people involved and their relations were so close that decisions could be and were made quickly and cleanly. We did not have the problem of having to make compromises or of endless delays. . . . The program was handled in an extraordinarily cooperative manner between the Air Force and CIA. Almost all of the people involved on the Government side were more interested in getting the job done than in claiming credit or gaining control.[46]

Bissell and Ritland first created a cover story about studying the environment using the program name Discoverer, for which they said they planned to use Thor intermediate range ballistic missiles and Agena upper stages to put experimental satellites in orbit, a function they could not hide. Wrote author Jeffrey T. Richelson, "Ostensibly a scientific and biomedical research effort that would give some small animals a once-in-a-lifetime joyride in space, [the cover story] would explain the repeated launches and recovery of payloads from orbit. . . . As a result, a significant portion of the Air Force's role, such as the procurement of boosters and launchers, could be conducted as an overt [public] effort."[47] The public face of the program was that "as a preliminary goal [to getting humans in space], it should be demonstrated that you could launch small mammals, small vehicles in space, orbit the earth, and recover them" and that program was to be called Discoverer.[48] The Air Force now had public authorization to develop a prototype demonstration satellite capability using a Thor IRBM with an upper stage, aimed at providing a demonstration of launch, orbit, and recovery.[49] They turned the program over to Lockheed's Jack Carter, who took it from there, although the program "was totally an AFBMD effort," according to Ritland.[50]

There were essentially two approved reconnaissance satellite programs, a covert one (Corona), with the Discoverer cover story of being a scientific program, and a public one, WS-117L, which had the enthusiastic support of a lot of engineers who knew nothing about Corona. There were no important technical distinctions between the two programs, according to NRO historian Robert Perry, but "for practical purposes, only the covert program had a real chance of final acceptance. The political climate was such that no open [public] attempt to orbit a reconnaissance satellite in the near future could secure support."[51] Spying from space was privately regarded as necessary but publicly regarded as distasteful, harkening back to the days of Secretary of State Henry Stimson's adage, "Gentlemen don't read each other's mail."[52]

Not long after they had approval for a covert photoreconnaissance satellite program, Bissel and Ritland made decisions about the camera system and the overall vehicle design. They decided "that after the Agena second-stage had separated from the Thor rocket booster and carried the payload (consisting of the camera and recovery vehicle) to orbit, it would remain attached. The Agena would ensure that the payload remained stable in orbit, as well as provide power." They also opted for camera maker Itek's design, which used a panoramic camera on the stable satellite platform.[53] AFBMD gave Lockheed approval to produce a development plan for program acceleration, which Schriever approved on December 5, 1957. The president had established the highest developmental priority for satellite, ballistic missile, and ballistic missile defense programs, called "DX priority," which gave them the same national urgency as the ICBM.[54] This new priority gave legitimacy to pushing both programs publicly but, more importantly, authorized the Corona program to go ahead.

Recalled Ritland, the Corona program "went for broke on the very first launch" as their "objective was to launch, orbit, photograph, deploy, and recover in the Hawaiian area a capsule that contained film of the reconnaissance effort." But things did not go very well. "Starting from there, we had progressive failures on the launch pad, some horrible examples of early mistakes, miswiring, lack of technical surveillance, thorough inspection, and whatnot."[55]

> We went through the first batch of vehicles that I'd recommend[ed for purchase] with absolutely no success. . . . I think we got up to around 12 vehicles with absolutely no success. We had a big meeting in Secretary of Defense Gates's office to make a determination as to whether we would continue the program. We were given one more chance as a result of that meeting. Lo and behold it worked. The results of that first effort were so astounding and complete that beyond a shadow of a doubt this approach to satellite information gathering was a certainty. And from that point on it was so important to continue that effort that the program was funded and no one worried about it—it's tremendous![56]

Also by this time, the space and missile efforts in Los Angeles had become enormous. According to an *Air Force* magazine article, by 1957, AFBMD had over 150 prime contracts and an "infinite" number of subcontracts, directly employing 2,000 people and indirectly employing another 40,000 more. They had the ICBM called "Atlas, its follow-up missile the Titan, the intermediate-range ballistic missile Thor, the solid-propellant Minuteman, initial operational capability for these missiles, and the advanced reconnaissance system. This composite program far exceeded, both in complexity and magnitude, the earlier Manhattan project."[57] But programs were not moving quickly, and as LeMay lamented in his memoir, testing had been underway for the Thor IRBM since January 1957 and on the Atlas-D since September 1959, the same month the Soviets hit the Moon with Lunik II.[58]

The programs in Los Angeles were now running in the billions of dollars. Schriever needed a general officer as a deputy who could make strategic decisions in Schriever's absence. Ritland's regular commission dated to 1939, and the date of his permanent promotion to colonel was July 23, 1953, after he left command in New Mexico (although he had been wearing colonel since August 1944). He was also not an air combat commander during either World War II or the Korean War and lacked a college degree, so a promotion was not an obvious step. However, he did have people going to bat for him, especially Schriever. There is a memo in Ritland's papers dated August 3, 1956, from Schriever to Maj Gen John Sessums, vice commander of ARDC, mentioning conversations Schriever had had with ARDC commander Power indicating they had talked about Ritland's promotion on "several occasions," implying that Power had blocked Ritland's promotion. While it is unlikely Power prevented Ritland's promotion for lack of a college degree since Power himself did not attend college, it is possible Power saw Ritland's lack of combat time as a negative. Or it could have been something else entirely. Nevertheless, Schriever did not see these "shortcomings" as reasons not to promote Ritland. Schriever argued to Sessums in the memo and likely to Power as well, "In my opinion, Colonel Ritland is an outstanding officer who has been highly qualified for promotion for several years. I would say, without reservation, that of all the colonels known to me, I would place Colonel Ritland as No. 1 on the list for promotion to Brigadier General." In October, Schriever officiated a ceremony in which Ritland was finally elevated to brigadier general. Said Schriever, who first met Ritland when Ritland was in Schriever's upper class at Randolph flying school in 1932, "we have been waiting for this for some time. . . . There has never been a nicer or more competent individual."[59] Now he had the heft of a general's star to help push US space programs.

Fig. 8. Ritland gestures emphatically during a meeting, his one-star rank prominent on both shoulders.

In February 1958, the Air Force eliminated the reconnaissance portion of WS-117L in a directive that Schriever approved and Bissell and Ritland had helped write, keeping the emphasis in WS-117L on the experiments the program might be able to perform.[60] The Corona reconnaissance satellite program, disguised as the Discoverer biomedical program, continued, facing several financial and technical issues in its development.[61]

On January 21, 1959, AFBMD was finally ready for the first attempt to launch a reconnaissance satellite using the Thor booster with an Agena upper stage, which also carried the camera and film supply, reflecting Ritland's "go for broke" comment. When the launch order came, there was a puff of smoke from the Agena, still sitting on top of the Thor, when the small, solid rockets that forced propellant into the rocket engine's fuel inlet prematurely fired. After inspection, the Agena upper stage turned out to be a total loss. People called this launch attempt Discoverer Ø.[62]

The next attempt came on the last day of February when, unsure of their ability to achieve orbit, the Air Force launched only a light engineering payload. The spacecraft never reached orbit and instead crashed near the South Pole. In April, Discoverer II achieved orbit in the correct orientation—tail-first—and stabilized in all three axes, the first satellite ever three-axis stabilized. As the spacecraft passed over Kodiak, Alaska, a controller entered the sequence to reset the timer on the automatic reentry counter. The console showed that he had sent the wrong command, so he reentered the command sequence but, under time pressure, he forgot to press the "Reset" button, and the new commands entered the vehicle, which added them to the old ones, locking out any further attempt to communicate with it. The next day, the capsule ejected from the vehicle and came down not in the warm Hawaiian "ballpark" where C-119 pilots like Captain Mitchell waited to snatch it from the sky but on snowy Spitzbergen Island, north of Norway. A race to recover the capsule's remains, which carried a pair of mice, not a camera, ensued, with the Soviets recovering the spacecraft and turning it over to their "rocket scientists."[63] According to Peebles, this mission was the source for Alistair McLean's novel *Ice Station Zebra*, in which Americans and Soviets raced to recover a Soviet reconnaissance satellite that came down in the Arctic carrying film of American missile silos and which later became a Rock Hudson movie. But Ritland recalled Discoverer II as a success, despite the fact they did not recover the reentry vehicle. He told the *Los Angles Examiner* that "we've gotten more information from that little stinker than you can imagine."[64]

The launches then came in rapid succession but with only small successes to boast about in what was increasingly looking like a space race with the Soviet Union. Attempts 3 and 4 launched in June, and flights 5 and 6 launched on August 13 and 19, 1959.[65] Ritland remarked on that feat in the press: "The successful orbiting of two Discoverer satellites in less than a week marks a tremendous forward step in the scientific study of space vehicles and their applications. The information and experience gained in the Discoverer series are preparing the way for launching of the first man in space."[66] The first mission to carry a camera into space was Discoverer IV, but the Agena upper stage burned out prematurely and it did not reach orbit. Among the failures that followed, Discoverer V's camera batteries failed on orbit, the range safety officer blew up Discoverer X when it headed off course, and Discoverer XI's reentry vehicle ejected but the spin-stabilization rockets exploded during reentry.[67] When Discoverer XII failed to reach orbit, the press reported that "a successful recovery, considered essential to America's man-in-space program, has proved elusive in the lengthy Discoverer series."[68]

Not everyone saw 12 straight launch failures as entirely negative. True to the engineering culture of the day, James Plummer, Lockheed's Corona program manager, said, "We didn't look at those as twelve failures, we looked at those as twelve successes. We were learning new things every time in every part of the missile and the recovery and all of the things that we had to do."[69] But others disagreed. Recalled Ritland, "Of course, the heat was beginning to get on when you had failure after failure after failure. This especially became true in the early Discoverer program where we were having too many failures. Schriever and I had to go into Washington into the Secretary of Defense's office and sit down with everybody and almost beg for one more chance before the program was cancelled. We got our chance and the program went on, and thank goodness it did, because it sure was a savior for this country."[70]

The first successful mission, Discoverer XIII, launched in August 1960, a year and a half after the first launch. Discoverer XIII, a diagnostic mission, did not carry a camera but an American flag. The spacecraft reached orbit and ground crews successfully contacted it. But the flight crews missed their recovery attempts and the capsule splashed down in the Pacific Ocean where it was recovered by US Navy frogmen, who spent the night in the water with the capsule before it was recovered and flown to Washington. There was a huge gathering at the White House with senior officers including Ritland present and a display of the flag for President Eisenhower.

On the very next mission, Discoverer XIV, the revolution began. As mentioned, the first air-recovered film capsule returned more imagery of the USSR than the 24 previous U-2 flights combined. The CIA reacted to the film recovery with "unbridled jubilation," according to NRO historian Perry. The CIA told USAF liaison officer Col Paul Worthman the photos were "terrific, stupendous, and had confessed 'we are flabbergasted.' Worthman's conservative report to General Ritland was that 'apparently design specifications on resolution have been met.' "[71] A few days later, Arthur Lundahl, director of the CIA's Photographic Interpretation Center, addressed an auditorium full of his photo interpreters—the individuals whose skill and special training would begin the process of turning overhead images into intelligence. "In the past, after film from U-2 missions was delivered to Washington, Lundahl's photo interpreters were shown a map of the Soviet Union with a squiggly line indicating the route of the U-2. . . . [This time,] instead of a single line across the map, there were seven vertical stripes emanating from the poles and moving diagonally across the Soviet Union. The interpreters knew the stripes represented the portions of the Soviet Union that had passed under the satellite's cameras. Their immediate reaction was to cheer. . . . They had an extensive amount of film to study."[72] Although the photo resolution was worse than that of the U-2's photos, the first five successful Corona missions punched a hole in the missile gap theory.[73]

Fig. 9. (from left) Gen Thomas D. White, Chief of Staff of the Air Force, Ritland, Schriever, and Col Lee Battle, Corona program office, with a recovered Corona film bucket.

Once word got out about how amazing the system's capabilities were, the inevitable fight over who was going to control it began. SAC's LeMay began to argue that a combat command like SAC should operate the reconnaissance satellite system when it was finally declared operational. Even before the first failed launches, Ritland had argued in a 1958 report, entitled "Preliminary Operational Concept of 117L," that the system, if run by SAC, would end up limiting its use to only gathering intelligence to use for nuclear targeting. Its potential was much greater, and he suggested a family of satellite systems based on the WS-117L concept could be used for other national interests, such as those of the CIA, Atomic Energy Commission, industry, the scientific community, or even the United Nations. He saw the future of satellites much more broadly, envisioning systems for communications, weather, nuclear test monitoring, science, or worldwide mapping, all capabilities we use satellites for today.[74]

Ritland not surprisingly suggested that AFBMD was the right agency to meet the needs of all the satellite systems' consumers. AFBMD was already operating the satellite system by gathering, transmitting, and receiving satellite data. But he also suggested that since one set of data could have more than one consumer, it would make sense to have a "neutral arbiter" running the system.[75] He suggested the Air Force was the logical place for a new service organization that was not a combat command that would only focus on launching and recovering satellites, not the exploitation of the data they were generating. And because of AFBMD's role as an R&D agency, two closely aligned organizations could be constantly on alert for novel programs and original techniques to exploit the new space environment.[76]

Ritland also borrowed from the State Department the argument that SAC's operation of satellite systems might "embarrass the United States." Ike's declared space policy was for the "peaceful uses of outer space," so placing SAC, the combat command responsible for nuclear attack, in charge of a major space program seemed contradictory. And Ritland, knowing the many possible applications for a satellite system, did not want the Air Force to "confuse space operations with space warfare." Operation by the military made sense to Ritland in that only the military had the resources, organization, and experience necessary to support such a program in the late 1950s.[77]

Ike, though, eventually disagreed with Ritland and LeMay by creating an agency independent of the military to operate reconnaissance programs. Deeming overhead reconnaissance too important to leave to the generals, in January 1961, the Department of Defense (DOD) and the CIA jointly chartered the National Reconnaissance Office (NRO), though keeping its existence classified until 1992. NRO was a separate agency responsible for consolidation of all DOD "satellite and air vehicle overflight projects for intelligence," and "for the complete management and conduct" of these programs.[78] The NRO procured and managed programs, taking a share of the military space program, including a huge bite out of AFBMD's space activity and shrinking the amount of space work under Schriever and Ritland's "normal" military development procedures and control.[79] The NRO also assumed authority for operating the nation's reconnaissance satellites, wresting that control away from AFBMD, too. The American space program now had three branches, one concerned primarily with space science (NASA), one concerned primarily with military support missions (DOD), and one concerned primarily with reconnaissance operations (NRO).[80] The people at these space agencies all had one goal in mind: deterrence. As Schriever put it in 2001, "I am looking for ways to avoid killing people. . . . We need to do something other than find ways to kill people better."[81]

In late March 1959, Schriever received a new assignment as commander of Air Research and Development Command and was promoted to lieutenant general. General Ritland became commander of the Air Force Ballistic Missile Division, overseeing the Midas, Samos, and Corona satellite programs as well as the Thor, Atlas, Titan, and Minuteman missile programs.

Newspapers covered the change of command responsibilities, spending much of their ink describing the new commander of the 545 officers, 157 enlisted Airmen, and 3,000 civilians at the Inglewood military base, which one article called "the biggest hardware store in the world." The *Los Angeles Examiner* covered Ritland's prime responsibility "to push development, production and earliest operational readiness of the Atlas, Titan and Minuteman intercontinental ballistic missiles for America's safety." The paper also listed his secondary responsibility as supporting NASA and DARPA "space projects," which of course meant supplying missiles for space launches and supporting the reconnaissance satellite programs, whose public face was still the Discoverer scientific satellite program. But much of the article focused on Ritland's background as a pilot, including his time as an airmail pilot and World War II test pilot. It also mentioned Ritland's love for tending roses and details about his family, including where daughters Kathleen and Susan were then in school. Other articles about the change of command had similar comments about the new leader, emphasizing his technical background and his military experiences.[82]

Schriever left Los Angeles, Ritland recalled, "when it really began to get difficult." Now it was Ritland who had to appear before US House and Senate appropriations committees and argue for USAF ballistic missile programs. During one hearing in 1959 before the

US House Appropriations Committee, Ritland got into "a tremendous argument" with members of the committee over two and half days about the missile programs all the military services had under development at the time. Eventually, the Air Force team convinced Congress of their needs because Ritland did not see any budget cuts.[83] However, in 1960 the Pentagon took over the presentations before Congress, and although Ritland was available for questions, he did not have to testify.[84]

Further organizational change occurred when Schriever, who had responsibility for all Air Force R&D and weapon systems acquisition but was still closely following space systems, streamlined management of the programs from DC. Ritland's AFBMD split into two organizations, one for missiles and one for space. Charles Terhune received his second star and sole responsibility for ballistic missiles. Ritland assumed command of the newly created Space Systems Division.[85] The idea behind the creation of SSD was to consolidate "applied research, advanced development and systems development" to speed up the time to field new technologies. It was SSD's responsibility to "take the requirement from a definition to hardware." But the reorganization also recognized that space had become coequal with ICBMs in the Air Force's plans, especially with the prospect of Air Force astronauts. With Secretary McNamara's decision to assign the USAF responsibility for all military space programs except the Navy's Transit (forerunner of today's GPS) and the Army's Advent (forerunner of today's communications satellites), Ritland's SSD had responsibility for procuring and launching all military space programs like Discoverer, Saint (an antisatellite [ASAT] program), and Midas (forerunner of today's missile early detection satellites). To do that, SSD had sites in Los Angeles, Sunnyvale, Edwards AFB, and Vandenberg AFB, all in California, and sites in Florida.[86]

Although publicly supporting Ike's policy of using "space for broadly defined peaceful purposes," the Air Force became increasingly concerned that its satellites, particularly the Midas infrared missile launch detection and Samos satellites, were vulnerable to Soviet ASAT systems.[87] With headlines like "Sky Spy Can Force Russ Diplomacy, Says Gen. Ritland," it is no wonder the military was looking for ways to keep space "peaceful."[88] At a November 1960 speech before the

American Society of Tool and Manufacturing Engineers, Ritland argued for "the development of orbiting sentinels—interceptor satellites capable of dispatching rockets to destroy the aggressor missiles." The Saint program, Ritland said, would "enable the United States to rendezvous a satellite with a possibly hostile vehicle and inspect it." Again, the idea was to protect American assets to ensure deterrence: "When the enemy knows we are equipped to monitor his war-making capabilities," Ritland told the audience, "he may, indeed, be less likely to rattle his rockets and more inclined to return with sincerity to the diplomatic bargaining tables."[89]

In September 1964, President Johnson and Secretary McNamara revealed that the United States had an operational satellite defense system.[90] In Congressional testimony in March 1965, Air Force Chief of Staff Gen John McConnell acknowledged the existence of the ASAT Program 437 to show the United States had the capability to defend against Soviet space systems and to counter a gap in the public's mind about what the United States could do. According to historian Clayton Chun, the admission of an ASAT program also served to counter Johnson's opponents' claims that he was "soft" on defense. But, Chun suggested, the ASAT program fell victim in the late 1960s to the pressures of the Vietnam War's "size and intensity" and later to the brief déténte between the United States and Soviet Union in the 1970s.[91]

Military space systems were growing into an integrated system to deter the Soviet Union. Ritland wrote in 1960 about the attack-warning satellite Midas as an extension of other early-warning systems like the Ballistic Missile Early Warning System (BMEWS) and their integration with " a communications satellite which will provide secure and instantaneous worldwide communications so essential to the operational environment of any conflict. . . . The deterrent contributions of such operational aerospace systems cannot be overemphasized."[92]

Corona was not the only space program Ritland worked on, but it was certainly the most revolutionary. According to NRO historian Perry, "In the context of its operational utility, exploitation of technology, and enhancement of the nation's fund of intelligence information, Corona had to be rated an outstanding success. Originally considered an interim system and assumed to have, at best, three or four years of operational utility, Corona remained the sole source of overflight intelligence for the United States for nearly five years, and was a primary source of basic information used to shape national defense policy for 12 years."[93] During those 12 years, "Corona cameras exposed more than 2,700,000 feet of film covering 750,000,000 square miles of the earth's surface. The last Corona satellites each carried more than 31,000 feet of 70-millimeter film, were capable of providing resolution of from six to ten feet, surveyed about seven million square miles during each mission, and returned cloud-free coverage of about three million square miles."[94] Perry wrote that

> Corona achievements were legion. Among those accounted most memorable when the program ended was a list of "firsts" that ranged from "first satellite in polar orbit" through "first dual-capsule reentry capability" to "first low-altitude satellite to utilize a solar array." Corona was the first satellite to be recovered, the first to operate in stabilized flight, the first to be recovered from the water, the first to be caught in descent, the first to incorporate an engine restart capability, the first to carry a stereo camera (and, of course, the first to carry any camera at all), the first to perform orbit adjust maneuvers, the first to carry "piggyback" satellites, and the first to utilize explicit guidance equations in its control circuitry. There were others.[95]

The 1958 estimate for the original 12 launches was about $59 million. The total cost, through May 1972, according to Perry, "was between $810 and $950 million." But, he added, "A great many totally valueless programs of the 1960s had cost more and had been cancelled before producing any results."[96]

On November 25, 1972, the only surviving Corona satellite became a museum artifact for the few who had the security clearance to get into the CIA's museum. Perry called its dedication "the first and probably only formal reunion of the many contributors to Corona's 15-year history," and included Ritland and Bissell.[97] Today the vehicle is in the National Air and Space Museum.

Corona may have been a revolution in gathered intelligence, argued historian Peebles, but it built on the previous decade's work in balloon reconnaissance and the U-2 programs and was a technological evolution. Analysis of Corona photos proved decisively that there was no bomber gap or missile gap. Ritland had been instrumental in the organization, management, and development of both U-2 and Corona programs. Both programs used the same CIA-Air Force-industry arrangement. The technology used in the early Corona program was the same technology used in the balloon programs. Many of the C-119 recovery pilots like Captain Mitchell had been both a balloon recovery pilot and a Corona recovery pilot. Even the airplanes, which had been modified to catch balloons, were the same ones used to catch Corona buckets. The photo interpreters analyzing the film were even the same. And both programs had the total backing of national leadership, especially President Eisenhower, which was especially important during the string of 14 straight Corona failures and after the U-2 shootdown.[98]

While he was commander in Los Angeles, Ritland worked on other satellite programs with now-declassified names like Argon, Lanyard, and Gambit, but Corona was the program that helped usher in a revolution in intelligence collection and revealed the myths of the missile gap and Soviet strategic superiority. And like the U-2 before it, Ritland was a key figure in making the revolution a reality.

Satellites were an important part of the national space effort and helped both in deterring Soviet aggression and exploring the physical universe. But, argued Ritland in a March 1959 speech, "Let me emphasize the point that we are going to place man in space. We are not going to be content with merely sending instruments out there. Man will just have to go out there and see for himself. In such adventures, we expect that our Air Force Ballistic Missile Division will continue to have a constructive role to play."[99] By the time astronauts landed on the Moon, they had been helped there through the efforts of many, including Osmond Ritland.

Notes

1. The C-119 was the same plane Capt Slaughter Mims had flown during the balloon program, catching three balloons near Japan, more than anyone else (Mitchell oral history, 15).

2. Frank S. Buzard, oral history with Robert Mulcahy (July 12, 2001), 22, Space Force Systems Command History Office.

3. Buzard oral history, 22.

4. Mitchell oral history, 28–30; "U.S. Captures Capsule from Satellite in Sky," *The Los Angeles Times* (August 20, 1960), 1.

5. Mitchell oral history, 28–29.

6. Robert A. Flavell, "To Catch a Falling Star: Aerial Recovery of Space Objects," *Air Power History* 43 (1994): 24–26. This phrase was also the motto of the 6594th Test Group. Pelican 9 is in the National Museum of the United States Air Force today.

7. Mitchell oral history, 30.

8. "U.S. Captures Capsule from Satellite in Sky," *The Los Angeles Times* (August 20, 1960), 1.

9. Buzard oral history, 24.

10. "Capsule-Catching Crew Works Like Ball Team," *The Los Angeles Times* (August 21, 1960), A.

11. Mitchell oral history, 5, 28–32.

12. Curtis Peebles, *The Corona Project: America's First Spy Satellites* (Naval Institute Press, 1997), 91; and Jonathan M. House, *A Military History of the Cold War 1944–1962* (University of Oklahoma Press, 2012), 397.

13. Curtis Peebles, *Twilight Warriors: Covert Air Operations Against the USSR* (Naval Institute Press, 2005), 157. Emphasis in the original.

14. "Fantastic Catch in the Sky, Record Leap toward Earth," *LIFE* (August 29, 1960), 20–25. The article immediately preceding this one in the issue is "A Red Show Tries the U.S. By Proxy" about the Powers show trial in Moscow.

15. For more on Ike's decision-making calculus, see McDougall, *. . . the Heavens and the Earth*, especially chap. 4.

16. Lt Gen Thomas W. Morgan, USAF, retired, interview by Dr. James C. Hasdorff, March 20–21, 1984, Jemez Springs, NM, transcript, 32, AFHRA, K239.0512-1576, cited in Arnold, *Spying from Space*, 14–15, 175n21.

17. Douglas Aircraft Company Inc., *Preliminary Design of a World Circling Spaceship* SM-11827 (May 2, 1946), reprint (RAND Corporation, 2000).

18. Bernard A. Schriever, interviewed by Carol Butler, Washington, DC, April 15, 1999, NASA Johnson Space Center Oral History Project, 3, https://historycollection.jsc.nasa.gov/, accessed May 31, 2023.

19. Ritland oral history, 230.

20. "Brigadier General William G. King, Jr.," *Space and Missile Pioneers*, 2, https://www.spaceforce.mil/, accessed February 27, 2026; and "Brigadier General William G. King, Jr.," official biography (October 15, 1969), https://www.af.mil/, accessed October 3, 2022.

21. Ritland oral history, 230.

22. B. A. Schriever, interview by Edgar F. Puryear Jr., June 20, 1977, transcript, 8, AFHRA, K239.0512-1492. As a comparison, $4 million in 1957 is over $46 million 2026 dollars.

23. Merton E. Davies and William R. Harris, *RAND's Role in the Evolution of Balloon and Satellite Observation Systems and Related U.S. Space Technology* (RAND, 1988), 24–26.

24. "Report of the Scientific Advisory Board Reconnaissance Panel on Reconnaissance from Satellite Vehicles," May 28, 1956, Dr. Carl F. J. Overhage, Chairman, AFHRA, K243.012-34, quoted in Arnold, *Spying from Space*, 40, 179n24.

25. Maj Gen L. C. Craigie, Air Force Director of Research and Development, SUBJ: Satellite Vehicles, 16 Jan. 48, with incl. by Gen. H. S. Vandenberg, Vice Chief of Staff of the Air Force, SUBJ: Statement of Policy for a Satellite Vehicle, 15 Jan. 48, to Brig. Gen. A. R. Crawford, Chief, Engineering Division, Air Materiel Command, in *USAF Space Programs, 1945–1962*, ed. Joseph W. Angell

Jr., (USAF Historical Liaison Office), Tab A, cited in Arnold, *Spying from Space*, 15, 175n23.

26. Gen Thomas D. White, "At the Dawn of the Space Age," *Air Power Historian* 5 (1958), 17, cited in Arnold, *Spying from Space*, 39, 178n20.

27. United States Air Force, *AFM* [Air Force Manual] *1-2, Air Doctrine, United States Air Force Basic Doctrine*, 1 Dec. 1959, quoted in Robert Frank Futrell, *Basic Thinking in the United States Air Force, 1961–1984*, vol.2 of *Ideas, Concepts, Doctrine* (Air University Press, 1989), 714–15, cited in Arnold, *Spying from Space*, 39, 178n20, 178n21.

28. O. J. Ritland, Denver, Colorado, May 26, 1959, in "Excerpts of speeches," Schriever papers, Box 164, Folder 6.

29. Ritland oral history, 231.

30. Ritland oral history, 231.

31. Ritland oral history, 231–32.

32. Ritland oral history, 232.

33. Ritland oral history, 233.

34. LeMay with Kantor, *Mission with LeMay*, 522.

35. Ritland oral history, 233–34.

36. B. A. Schriever, interview by author, Washington, DC, tape recording, June 27, 2001, quoted in Arnold, *Spying from Space*, 40, 179n23.

37. Ritland oral history, 234.

38. Schriever, oral history, NASA, 5.

39. Lorine Flemons Wright, "Major General Blazes Path in Air Force History," *Rancho Santa Fe Review* (October 24, 1990), 23, provided by daughter Kathleen Ritland Montoya.

40. Ritland oral history, 235.

41. Killian *Sputnik, Scientists, and Eisenhower*, 3–4.

42. Richelson, *The Wizards of Langley*, 23.

43. Ritland oral history, 236.

44. Ritland oral history, 238.

45. Richelson, *The Wizards of Langley*, 23.

46. Kenneth E. Greer, "Corona (The First Photographic Reconnaissance Satellite)," *Studies in Intelligence* 17 (Spring 1973), 6–7, https://catalog.archives.gov/, accessed December 20, 2022.

47. Richelson, *Wizards of Langley*, 24.

48. Ritland oral history, 237; Spires, *Orbital Futures*, 960.

49. Ritland interview, 238a.

50. Ritland oral history, 238.

51. Robert Perry, "A History of Satellite Reconnaissance," vol. 1 (National Reconnaissance Office, October 1973), 40–41.

52. Olga Khazan, "Gentlemen Reading Each Other's Mail: A Brief History of Diplomatic Spying," *The Atlantic* (June 17, 2013), https://www.theatlantic.com/, accessed July 17, 2023.

53. Richelson, *The Wizards of Langley*, 24.

54. "Introduction," *Weapon System 117L Development Plan for Program Acceleration*, 5 Jan. 1958, AFHRA, K243.8636-41; MEMO, Col. F. C. E. Oder, Assistant for WS 117L, to Col. Terhune, Western Development Division Deputy Commander for Weapon Systems, SUBJ: "R-W [Ramo-Wooldridge] participation in WS 117L," 14 Feb. 1958, AFHRA, K243.012-36; and Perry, Vol I, 42, cited in Arnold, *Spying from Space*, 70, 182n24.

55. Ritland oral history, 239.

56. Ritland oral history, 240.

57. Ernest G. Schwiebert, "USAF's Ballistic Missiles—1954–1964: A Concise History," *Air Force and Space Digest* (May 1964), 100. Thanks to LeMay with Kantor's *Mission with LeMay* for pointing out this article on p. 478.

58. LeMay and Kantor, *Mission with LeMay*, 478–79.

59. Memo, Schriever to Sessums, August 3, 1956, Ritland papers; and Ritland home movies, Disc 14, track 1, the brigadier general promotion ceremony. Ritland pinned on his star on October 25, 1956.

60. Perry, "A History of Satellite Reconnaissance," 42–44.

61. Perry, "A History of Satellite Reconnaissance," 49–87.

62. James S. Coolbaugh, "Genesis of the USAF's First Satellite Programme," *Journal of the British Interplanetary Society* 51 (August 1998), 299; and Perry, "A History of Satellite Reconnaissance," 89, cited in Arnold, *Spying from Space*, 63, 181n1.

63. Richard Sweeny, "Discover II Orbital Attitude Controlled," *Space Technology* 2 (July 1959): 26–27; Day, *Eye in the* Sky, 52–53; Peebles, *Corona*, 66–67; Perry, "A History of Satellite Reconnaissance," 89–90, cited in Arnold, *Spying from Space*, 63, 181n2. For more on the Soviet space program, see Asif A. Siddiqi, *Challenge to Apollo: The Soviet Union and the Space Race, 1945–1974* (NASA, SP-2000-4408, 2000).

64. Julian Hartt, "Profile of General Ritland, New Chief of Missile Center," *Los Angeles Examiner* (May 31, 1959), 17, Ritland papers.

65. Peebles, *The Corona Project*, Appendix 1, 272–73.

66. "U.S. Orbits 1,700-Pound Discoverer VI," *The Stars and Stripes* (August 21, 1959), 1.

67. Peebles, *The Corona Project*, 91; and Dwayne A. Day, "The Development and Improvement of the Satellite," in Day, *Eye in the Sky*, 52–62, cited in Arnold, *Spying from Space*, 63–64, 181n3.

68. "Discoverer XII Fired," *The New York Times* (June 30, 1960), 9.

69. James W. Plummer, telephone interview by author, tape recording, 8 Sept. 2001, cited in Arnold, *Spying from Space*, 64, 181n4.

70. Ritland oral history, 192.

71. Perry, "A History of Satellite Reconnaissance," 99–100.

72. Richelson, *The Wizards of Langley*, 25–26.

73. Perry, "A History of Satellite Reconnaissance," 100.

74. Col. O. J. Ritland, Draft of "Preliminary Operational Concept of 117L," July 28, 1958, 1-2, AFHRA, K243.012-36, cited in Arnold, *Spying from Space*, 78, 184n53.

75. Ritland, Draft of "Preliminary Operational Concept of 117L," 3–4, cited in Arnold, *Spying from Space*, 79, 184n54.

76. Ritland, Draft of "Preliminary Operational Concept of 117L," 6, cited in Arnold, *Spying from Space*, 79, 184n55; and Schriever, "The Operational Urgency of R&D," 235, cited in Arnold, *Spying from Space*, 79, 184n56.

77. Ritland, Draft of "Preliminary Operational Concept of 117L," 6, cited in Arnold, *Spying from Space*, 79, 184n57.

78. Cyrus Vance, Deputy Secretary of Defense, Department of Defense Directive Number TS 5105.23, "National Reconnaissance Office," March 27, 1964, in *Exploring the Unknown*, vol. 1, 373–74, cited in Arnold, *Spying from Space*, 74, 183n38; and Spires, *Orbital Futures*, 973. With the exception of this directive, the defense department prohibited using the terms National Reconnaissance Office, National Reconnaissance Program, or NRO in any

document. Any reference had to use the phrase "Matters under the purview of DoD TS-5105.23."

79. John L. McLucas, "The U.S. Space Program Since 1961: A Personal Assessment," in *The U.S. Air Force in Space: 1945 to the 21st Century*, ed. R. Cargill Hall and Jacob Neufeld (USAF History and Museums Program, 1998), 85–87, cited in Arnold, *Spying from Space*, 74, 183n39.

80. See, for example, Mark A. Erickson, *Into the Unknown Together: The DoD, NASA, and Early Spaceflight* (Air University Press, 2005).

81. Schriever, interview with author, cited in Arnold, *Spying from Space*, 8, 174n17.

82. Hartt, "Profile of General Ritland"; and "Ex-Test Pilot Takes Over as USAF's Missile Chief," *The Stars and Stripes* (May 7, 1959), Ritland papers.

83. Ritland oral history, 166–68.

84. Ritland oral history, 173.

85. Spires, *Orbital Futures*, 970.

86. "AF Space Management Tasks Centralized," *Aviation Week* (September 25, 1961), 89.

87. Richard Fryklund, "First Space Soldier May Be a Mechanic," *Washington Evening Star* (September 26, 1960), A-14.

88. Julian Hartt, "Sky Spy Can Force Russ Diplomacy, Says Gen. Ritland," *Los Angeles Examiner* (n.d.), NASA Archives, Washington, DC, Box 8/14/1. The article is actually about the Samos family of infrared-sensing, missile early warning satellites, but the headline shows the extent to which many people considered space-based surveillance to be espionage.

89. "General Urges System of Interceptor Satellites," *The Los Angeles Times* (November 15, 1960), 12.

90. General B. A. Schriever, "The USAF in Space," *Spaceflight* (April 1964), 114.

91. Clayton K. S. Chun, *Shooting Down a "Star": Program 437, the US Nuclear ASAT System and Present-Day Copycat Killers* (Air University Press, The Cadre Papers, April 2000), 22, 30.

92. Ritland, "Air Force Missiles," 577–78.

93. Perry, "A History of Satellite Reconnaissance," 219–20.

94. Perry, "A History of Satellite Reconnaissance," 220.

95. Perry, "A History of Satellite Reconnaissance," 221.

96. Perry, "A History of Satellite Reconnaissance," 224–25.

97. Perry, "A History of Satellite Reconnaissance," 223–24.

98. Peebles, *Shadow Flights*, 276–77.

99. Ritland, March 20, 1959, in Coronado, California, in "Excerpts of speeches," Schriever papers.

Chapter 8

Flying Astronauts

On Saturday, August 21, 1965, after two days of delays, Guenter F. Wendt, the McDonnell Aerospace pad leader, squeezed astronauts L. Gordon Cooper, on his second and last spaceflight, through the left hatch and spaceflight rookie Charles "Pete" Conrad through the right hatch of their two-person Gemini spacecraft, nicknamed The Covered Wagon. The spacecraft, Cooper remembered in a 1998 interview, was "absolutely crammed" with equipment for their flight. "We had the first fuel cell. We had the first radar. We had the first all-up [reprogrammable] computer. These were all things that needed to be tested and proven. And we had 20-some-odd cameras of different types and several hundred rolls of film of different kinds."[1]

At 9 a.m. the Titan II's engines ignited, and Gemini V lifted off on what was planned to be the longest spaceflight humans had ever attempted, depicted in their crew's motto, "Eight Days or Bust." Launch, according to Conrad's biographer and wife, Nancy, "was the same G-pulling feeling as a really tight turn in the F-4 going Mach-plus and then some, which was right up there with sex for Pete Conrad. They'd pull seven Gs before they were out of the atmosphere."[2] Although it was supposed to have been eliminated, the crew began to experience an effect like riding on a pogo stick as the rocket pounded them forward and back on its way into space. According to NASA's official Gemini history, "Oscillations reached +0.38g during stage 1 flight, exceeding the permitted +0.25g for a total of about 13 seconds."[3] Then a few seconds before they were released into orbit from the booster, the bouncing stopped, and Gemini V was inserted into an orbit of 101 by 216 miles. (The International Space Station orbits at about 250 miles today.) Recalled Cooper later in his memoir, "In fact, compared with the thin-skinned Atlas [which he had flown during his Mercury mission], the Titan, a solid, thick-walled booster, was like cruising down the road in a Cadillac."[4] Conrad wrote in his *LIFE* magazine piece that after they had achieved orbit, "I was sure we had our eight days, too. It was the cat's bandana!"[5]

The astronauts soon got to work by, among other tasks, ejecting the pod they were supposed to use to test rendezvous procedures, the "Little Rascal" that contained "a radar transponder, batteries, and a flashing beacon."[6] Then Cooper noticed a problem with the fuel cells, which he eventually shut down, severely limiting electrical power on the spacecraft. They began to wonder if they would have enough power to run their experiments and it was starting to look like their mission might be more bust than eight days.[7] Lead ground controller Christopher Kraft ordered the recovery fleet of six aircraft, a destroyer, and an oil tanker to head for the recovery area southeast of Hawaii.[8] Worried about their ability to get the most important task done before they had to come home, the crew temporarily powered the fuel cells back up, long enough to practice rendezvous procedures, putting any doubts behind them about astronauts' ability to rendezvous with another object in space. But after consultations and tests on the ground, even with the fuel cells now powered down, NASA decided to continue the mission. Replied Cooper to mission control, "I was hoping you would say that."[9]

The crew also practiced their visual observational techniques. "They saw smoke at Laredo, Texas, for example, but did not see a huge checkerboard pattern that had been laid out for them on a field." Over the next couple of days, "they saw a rocket sled test as they flew over Holloman Air Force Base, New Mexico. Over Vandenberg, on the next pass, they sighted the contrail of a chase plane just before they glimpsed the ignition of a Minuteman missile." When he spotted the ICBM launch, Conrad shouted "I see it, I see it!" According to one report, they were able to track the rocket and obtain infrared signature data on the missile. The next day they again saw a Vandenberg missile launch but could not track its radiation signature. They later tracked the radiation signature of the rocket sled on the track in New Mexico.[10] While flying over the ocean, Cooper and Conrad took photos of their recovery carrier, USS *Lake Champlain*, with a destroyer astern, using the 1,270 mm telephoto lens.[11]

Still, the spacecraft continued to have problems. The next major issue was the orbital attitude and maneuvering system (OAMS), which grew sluggish, and then one thruster quit. The OAMS was used for moving the spacecraft around in its orbit. Flight director Christopher Kraft then canceled all experiments that required fuel, and the crew turned off the electrical system to help reduce the water buildup in the bladders supporting both fresh water and the fuel cells. When they eclipsed the Soviets' spaceflight time duration record, ground crews suggested the crew do a victory roll but Conrad radioed back, "I ain't got the fuel, sorry!"[12] When a second thruster quit, they could no longer hold the spacecraft steady and began to tumble slowly in orbit.[13] They corrected some of the attitude, Cooper recalled later, by purging hydrogen and oxygen from the fuel cells and even dumping urine to give themselves "three more attitude thrusters," which helped them get a few more experiments done.[14]

According to NASA's official history, "Despite all the problems, the crew did a creditable job on the experiments," high bureaucratic praise for these two astronauts. An important DOD experiment was scrubbed—D-2, Nearby Object Photography—because it depended on rendezvous with the pod, which could not be accomplished when the OAMS failed. Experiment D-2 would have shown how astronauts could get "high resolution photographs of an orbiting object while maneuvering, station keeping and observing in a manual control mode," according to the press package handed out before the flight. After maneuvering around the rendezvous evaluation pod, they would have used a 200mm lens to photograph it. (Instead, the pod burned up over California.) Two other military photography experiments were successful. According to NASA's official Gemini program history, "Experiment D-1, Basic Object Photography, proved that the crew could acquire, track, and photograph" objects in space like the booster, rendezvous evaluation pod, and natural celestial bodies such as the Moon. The crew used a 35mm Zeiss Contarex camera, very similar to any single lens reflex camera of the time, mounted on Conrad's right-side window, using a 1270mm lens for celestial body photographs. "Weather conditions somewhat hampered [experiment] D-6, Surface Photography, but Cooper and Conrad did obtain photographs of Merritt Island, Florida; Tampico, Mexico; Rocas Island, Brazil; and Love Field, Dallas, Texas."[15] In Experiment D-6, they investigated their ability to acquire, track, and photograph objects on the Earth. They had a list of areas to be photographed, including "cities, rail, highways, harbors, rivers, lakes, illuminated night-side sites, ships and wakes," all within the United States and Africa, according to the press package.[16] Gemini V was important to the Air Force because of these visual experiments the astronauts performed on orbit, which had an impact on space programs that Osmond Ritland ran.

They expected to see five active volcanoes in their flight path, including Kilauea in Hawaii and three others in Central America. "Defense experiments D-4/D-7, Celestial Radiometry and Space Object Photography, were combined to make irradiance measurements on celestial and terrestrial backgrounds and on rocket plumes. The final defense experiment—S-8/D-13, Visual Acuity/Astronaut Visibility—combined use of an inflight vision tester and the observation of rectangular marks in fields near Laredo, Texas, and Carnarvon, Australia." NASA had laid white sheets on the ground with symbols on them for the astronauts to use to see the sites. "Weather and operational problems made ground observations difficult—they never were able to see the Carnarvon field, but the Laredo pattern was partially read in the 48th revolution."[17] Conrad recalled later that he "was impressed with how well we could see from 140 nautical miles (high) in orbit. I remember seeing red roofs in China. We could pick out interstates and large clusters of buildings. We could figure out what cities we were looking at during the night just by lighting patterns."[18]

According to the official NASA history, "Cooper obtained the first photographs of the light of the moonless sky (zodiacal light and the gegenschein), [during] experiment S-1. He made a series of stepped exposures and took two pictures of the gegenschein, a faint nebulous light opposite the Sun. Like their predecessors, Cooper and Conrad took synoptic terrain and weather photographs. Pictures of the Zagros Mountains showed more detail than the official Geologic Map of Iran. The crew also provided pictorial cloud studies, including tropical storm Doreen. S-7, Cloud-Top Spectrometer, the other science experiment, proved the feasibility of making cloud altitude measurements from spacecraft."[19]

Deorbit, descent, and splashdown all went smoothly. While they were still aboard *Lake Champlain*, some of the film was immediately processed and shown to the astronauts. Cooper recalled someone walking into the wardroom and telling him "that all the photos and negatives" from one of their cameras "were being confiscated and the experiment classified." He recalled in his memoir being "livid, but there was nothing I could do." A couple of weeks later, at the White House to receive medals for their space flight, LBJ told them he had ordered the pictures classified. "The commander-in-chief had spoken, and there was nothing else to say."[20] It was not all the photos that were classified, only certain ones. Many were released to the public.[21] There is a beautiful cover and photo spread in the September 24, 1965, edition of *LIFE* magazine featuring some of the photos they took on orbit.[22]

Gemini V is best known for having broken the record for length of a spaceflight, setting it at almost 191 hours, or about eight days, a record that would not even last two Gemini missions when Frank Borman and Jim Lovell broke the record with a flight that lasted almost two weeks. But Cooper and Conrad had proven that humans could spend a long time working in the weightless environment of space. Not at all coincidentally but by plan, their eight days on orbit also happened to be how long it would take to get to the Moon and back, and the rendezvous practice that the astronauts demonstrated added to NASA's confidence it could meet JFK's deadline of landing a man on the Moon by the end of the decade.[23] They also were hit "four or five times" during the mission by what were most likely the remnants of the Cygnid meteor shower, which had peaked the week before launch. The astronauts learned after landing that "impressions were found on the outside wall [of the spacecraft], as if someone had driven home an ice pick with a hammer."[24]

Much about the astronauts is known, but little is known about how the machines they flew in were readied for flight. Many people worked on American space programs—numbers reached the hundreds of thousands by the time of Apollo—but few were as important in getting astronauts into space after failures than Osmond Ritland, called out in NASA's own official history of the Mercury Program as the "former test pilot in command of the Air Force Ballistic Missile Division" who, along with Bernhard Hohmann and Ernst Letsch, "assured the astronauts that their interests would not be sacrificed" following a string of failed Atlas missile test launches.[25] The story of getting spacecraft ready for human-crewed missions reveals Ritland's technical background and his leadership abilities across two important space programs needed to get to the Moon and another military space program that reveals what might have been.

Ritland recalled thinking it was a good idea to have test pilots as the first astronauts.

> Because of my heritage and experience as a test pilot, I always felt that, ideally, people with that experience in their so-called nerve ends, reaction time, operation under stress, unusual conditions, etc., would be ideal as astronauts. So I favored that kind of an approach, but I didn't have anything to do with it whatsoever. But I do know that when the astronauts were appointed and assigned to the task, one of the first things they did was to come out and visit us at BMD because they knew that we were going to be the provider of their booster system. I have lots of pictures of the first seven astronauts, Glenn, Grissom, and the whole gang. Jimmy Doolittle was there from a prestige point of view. At the very first meeting with them, I emphasized that they were among friends because my experiences as a test pilot clearly showed that I understood their feelings and their approach to problems. I assured them that they could depend upon us, that we had their safety and keen interest at heart, as they would see for themselves.[26]

Astronaut Deke Slayton, for one, was happy for Ritland's leadership. "Everybody was in a hurry," Slayton wrote. "The Space Task Group was planning the first Redstone launches for early 1960, with orbital Atlas flights to follow in a few months. The whole program was supposed to be completed by the summer of 1961."[27]

By the time Ritland met with the astronauts, several American programs had been researching human spaceflight, including the Navy's Manned Earth Reconnaissance program and the Army's Project Adam, both of which went nowhere. There was also Project Man High that floated researchers in a balloon over 100,000 feet to the edge of space and the X-15 rocket plane that went even higher.

Another sophisticated program predated NASA and whose requirements AFBMD first developed, in 1957, was the Air Force's program, Man-In-Space-Soonest, with the unfortunate acronym of MISS. NACA, a predecessor agency of NASA, served as the consultant and a testing agency—a contractor—for the Air Force on spacecraft design and development at their Langley research facilities in Virginia. ARDC sent AFBMD's development plan for a piloted spacecraft to Air Force Headquarters in March 1958, requesting $133 million from ARPA for "manned satellite development" that year. Ironically, on the same day Ike proposed to Congress creating NASA, the Joint Chiefs approved the Air Force's man-in-space project. This approval resulted in a joint Air Force–NACA project.[28]

AFBMD created a "Man-In-Space Task Force" in LA to work on an "Air Force Manned Military Space System Development Plan." The final goal was to "achieve an early capability to land a man on the moon and return him safely to earth," which sounds a lot like the language President Kennedy used in 1961 to convince Congress to race the USSR to the Moon. The first step was the MISS program, to put a capsule on top of an ICBM and, using a ballistic trajectory that did not reach orbit, launch just instruments, then primates, and then a human being. The next phase, "Man-in-Space-Sophisticated," would use a heavier capsule to achieve orbit for as many as 14 days. The third phase was to reach the Moon with an instrumented capsule and to achieve a soft landing. The last phase, "Manned Lunar Landing and Return," would send another capsule around the Moon with first primates and then humans, and eventually land and safely return to Earth, in an approach that on the surface appears to be NASA's later Mercury, Gemini, and Apollo programs. Instead of designing and building all-new rockets, however, a Thor-Vanguard, a Thor with a fluorine upper stage, and a "Super Titan" topped by fluorine second and third stages would be the launch vehicles for each phase. AFBMD delivered detailed designs and procedures for MISS on May 2, proposing it could put a person in Earth orbit by October 1960.[29] On June 25, 1958, the Air Force briefed its preliminary list of nine candidates to fly in the MISS program, including some very familiar names like Neil Armstrong, Scott Crossfield, and Iven Kincheloe, whom the press had subbed "Mr. Space" for his Bell X-2 flight to 126,200 feet in 1956.[30]

But costs ballooned to $1.5 billion and ARPA began to have second thoughts about spending DOD money on human spaceflight. When NASA stood up in July 1958, Ike assigned it the human spaceflight mission.[31] The MISS program merged with NASA's Space Task Group (STG) in November 1958, which was supposed "to implement the manned satellite project" that it had been running in parallel to MISS for several months. STG put together the requirements for astronauts' technical skills and background. In December, Ike also decided that the group of military test pilots then flying would make a good pool of candidates to be the first astronauts. When NASA sent the qualification requirements to the military, over 100 men were qualified. Later that month, NASA renamed its first human spaceflight program Project Mercury. Screening began in January 1959 and in April, NASA publicly announced the seven Mercury astronauts.[32] But there was still a long way to go before putting humans in orbit and the Air Force did not entirely set aside its thoughts about military astronauts.

To make the Atlas safe for human spaceflight, a system to save the life of the astronaut in the event of a rocket failure needed to be devised. Tension arose between AFBMD, which wanted an operational ICBM to deliver nuclear weapons on targets, and NASA's Space Task Group (STG), which wanted a rocket to put humans in Earth's orbit. NASA knew that its own engineers did not know much about the Atlas.[33] AFBMD's systems engineering partner Space Technology Laboratories (STL) had broad "experience in systems engineering, missile development, and business management" but "STG had a deeper background in research and was directly responsible for the development of" the Mercury program.[34] Ritland therefore appointed Hohmann in August 1959 to supervise the systems engineering of "a pilot safety and reliability program on the Mercury-Atlas series" at STL in California.

At a press conference in California in September 1959, Ritland sat with Jimmy Doolittle and six of the Mercury Seven to discuss the Air Force Ballistic Missile Division's role in Project Mercury with the press, part of a series of meetings he was having with the Mercury astronauts to update them on AFBMD's progress.

Ritland's team of government and contractors had responsibility for guiding the Atlas into orbit, developing the abort system, and helping with communications and tracking. By this time, the division had a lot of experience with all these tasks, except the abort system, given their work launching satellites that had started a few years before. Ritland compared the work they were doing to get ready to put astronauts in orbit with the work of "the flight test business."[35]

One question from the press asked Doolittle and Ritland to compare their test flight experience with preparing for a space launch. The response from the 62-year-old Doolittle was typically self-deprecating: "I get the impression that my role here is one of contrasts, in order that you ladies and gentlemen may see the difference in appearance between an old aviator and six very attractive young astronauts." Ritland, though, pointed out that the relationship between pilots and engineers had changed in the years since he was in the test community. "I know that the engineers, test engineers, had me do things that I thought were pretty ridiculous and pretty crazy. I hope these people have the sense that they can talk to the people who have an understanding of their problem." Doolittle simplified the comparison even further: "I would say that that is the biggest difference between the early days of testing and today. There is complete rapport between the pilot today or the astronaut today and the individual who is making and testing his equipment."[36]

Each of the seven Mercury astronauts, all of whom were engineers and test pilots and assigned to STG, was involved in a different area of the design and development of the program. Deke Slayton was the Mercury astronaut working with the Atlas team. He spent a lot of time at the Atlas factory giving "them the astronaut's point of view while learning whatever it was they needed [the astronauts] to know, then to communicate that to the rest of the group."[37] The Mercury spacecraft, being built by McDonnell in St. Louis, had to work seamlessly with the Atlas missile, being built by Convair in San Diego. It was Deke's first experience with "integration." He recalled in the book *We Seven* that he tried

> to attend all of the coordinating meetings which involved figuring out ways to put the capsule on top of the Atlas and

> mate the two of them together. They were being built by different companies hundreds of miles apart, and they were both darned stubborn machines. We assumed there might be something about that capsule sitting on top of it that the Atlas would not like—the extra weight and the aerodynamic roughness, for example—and we had to try and assess this problem ahead of time and make sure that the Atlas people were aware of it and could take it into account as they prepared our boosters. . . . I was performing, essentially, like a test pilot for an aircraft company.[38]

Deke had questions, of course, given that he thought he would one day ride on top of an Atlas himself. "Did the extra weight and different aerodynamics of the Mercury [capsule] affect the Atlas performance? Did noise and vibration of an Atlas launch do something to the Mercury [capsule]?"[39] Inquiring minds whose lives were on the line wanted to know.

During the 1950s, engineers started applying "statistical quality control to ensure the reliability of weapon systems and automatic machinery. The science of operations analysis and the art of quality management had emerged by the end of the decade as special vocations." The official NASA Mercury history made comparisons to cars: The more critical parts there were in a car, "the higher the quality level of each individual part must be if the end product is to be reliable." But this was in an age when cars had 688 critical parts. Estimates showed that Atlas had over 40,000 critical parts and the Mercury capsule another 40,000 more. Where do you begin when considering making the whole thing safe for human spaceflight? Eventually NASA settled on the concepts of "pilot safety" and "mission success."[40] Pilot safety would be set at over 99 percent for each phase of the mission (boost, orbit, reentry) and mission assurance would be set at 80–99 percent depending on the phase of the mission.[41]

But statistical assurance was not enough. NASA wanted additional insurance built into the system that could warn of an impending rocket failure and automatically abort the flight to save the life of the astronaut.[42] The burden of implementing an abort detection system that could save the life of an astronaut in case of a rocket failure eventually fell on the Atlas manufacturer, Convair. Atlas was a stable system with 116 launches before the first Mercury-Atlas flight with an astronaut, so the system was well-understood. At the Convair plant during a visit, when asked what he wanted the workers to do, astronaut Gus Grissom answered simply, "Do good work." According to one engineer, that phrase became the motto for everyone working on the Atlas program.[43]

The result was the Abort Sensing and Implementation System or ASIS, "the only part of the Atlas created solely for the purpose of man-rating that missile."[44] Engineers settled on two sensors to monitor for catastrophic indications from the liquid oxygen tank pressure, bulkhead pressure, booster attitude in all three axes, rocket engine injector manifold pressures, sustainer hydraulic pressure, and primary electric power. If any one of those systems should fail or get out of tolerance, "ASIS would by itself initiate the explosive escape sequence" to separate the capsule from the booster before the rocket exploded. Or the test conductor, flight director, range safety officer, or the astronaut could initiate an abort.[45] "By the end of 1959, Hohmann had sold his plans for pilot safety. They were based on applying supercharged aircraft production techniques to industrial practices for military missile production. To live with the Atlas required no less and eventually much more."[46] In NASA's words, "Together with Major General Osmond J. Ritland, former test pilot in command of the Air Force Ballistic Missile Division, Hohmann assured the astronauts that their interests would never be sacrificed."[47] Many of the ideas from the Mercury program used to improve reliability are now standard in all space launch vehicles and, according to one engineer, "should be considered space-rating rather than man-rating."[48]

Although the ASIS work was in progress, the first launch of an Atlas rocket with a Mercury capsule on top occurred July 29, 1960, without an escape system. After less than a minute of flight and reaching an altitude of just over eight miles, "the booster apparently suffered major structural failures," according to a NASA report from August 1960.[49] Ritland appointed Col Paul Worthman to work with NASA's Richard Rhode on a team to figure out why the Atlas failed. They met in San Diego with Convair continuously between December 1960 and January 1961. The Atlas was a very thin-skinned rocket, made up of steel only 0.01 inches thick. With pressurized internal fuel tanks, Atlas could survive the rigors of launch, but as it burned fuel, the rocket became less able to handle launch stresses. The solution was a "belly band" or "horse collar," basically an eight-inch steel band just below the adapter ring, to reinforce the booster and the adapter between the spacecraft and the rocket, which was where the rocket felt the highest stresses during launch.[50]

Following the successful launch of "astrochimp" Ham on January 1961, NASA felt it was time for another test of the Mercury-Atlas system intended to get an American in orbit. MA-2, on February 21, 1961, was also the first test of the ASIS system. Ritland was in Florida to witness the test from outside the control center that day but with a press release "in his pocket making this shot a NASA 'overload' test in case of failure." Fortunately, the Atlas roared off its pad at 9:12 a.m. for a successful flight of the new adapted booster and the ASIS system. According to Ritland's daughter, after the launch, Ritland and his fellow engineers cut their neckties in half to celebrate their success. At a press conference later that day, STG boss Bob Gilruth announced that John Glenn, Gus Grissom, and Al Shepard had begun their training for crewed Mercury missions.[51] Although several more test flights followed, NASA was on its way to putting an astronaut in space. Ritland helped by pushing the contractors to keep the same crews at work on the Atlas missions so they would be extremely experienced when the time came to launch a human astronaut aboard an Atlas.[52]

Disaster, nevertheless, followed for the American space program when on April 12, 1961, Yuri Gagarin became the first human in space, adding another item to the Soviet Union's list of space accomplishments, which included the first satellite to orbit Earth and the first dog to orbit Earth. The United States was clearly behind in the space race, but with a new president inaugurated in January, there was a chance for a new approach to space for the nation. When JFK asked his vice president what the nation could do in space, LBJ responded by telling him that "accomplishments in space are being increasingly identified as a major indicator of world leadership," so the United States had to act before "the margin of control over space and over men's minds through space accomplishments will have swung so far on the Russian side that we will not be able to catch up, let alone assume leadership."[53] Then just two weeks after Shepard's suborbital flight, JFK went to Congress to declare it his goal, before the end of the decade, to land humans on the Moon, speeding up plans that had been in slow motion for years.[54]

Two weeks later NASA again launched a Mercury capsule aboard an Atlas rocket, and this time the booster failed. This launch, though, could have been considered a "successful failure." The spacecraft, carrying a "crewman simulator" that was "an electronic mannequin that could 'inhale' and 'exhale'" like a human being, was carried away by the ASIS system, lifted to 24,000 feet, and gently parachuted back to the Earth. The spacecraft recovery team treated it just like it had an actual astronaut on board whose life was at stake. The separated capsule was not only recovered but refurbished in time to be recycled for the next flight. The range safety officer had destroyed the booster when it veered off course and not much of the booster was left, though, in a fluke, the booster's computer was found buried in the mud near the beach. Of course, another lengthy review followed this disaster.[55] In his comments to Schriever, Ritland said MA-3's booster, Atlas 100D, failed because the autopilot failed. The accident investigation board took apart all sorts of components, finding the one transistor in five million manufactured that failed. They also took apart 88D's computer and found a coating on the connector pins of the programmer boards. After cleaning them and reviewing all the procedures, they got ready for MA-4, which would use Atlas 88D. Ritland wrote, "The record of quality control for 88D indicates the vehicle to be of excellent quality, well above the average ATLAS . . . . I would like to assure you that no program and no booster has received more detailed attention from me than has MERCURY and booster 88D."[56] Despite some different problems, MA-4 reached orbit in September, setting the stage for Enos the chimpanzee's flight around the Earth in November.[57]

Fig. 10. Ritland and John Glenn stand with members of the Mercury-Atlas Flight Review Board. [Ritland family photo]

By the time of John Glenn's flight nearly a year later, ASIS worked as advertised, which gave him some relief on his flight. Ritland chaired the Mercury-Atlas Flight Review Board and presided over the board proceedings and signed the certificate attesting to the flight readiness of Glenn's Atlas, which successfully launched as MA-6 on February 20, 1962.[58] Ritland recalled that as they got ready for launch, Glenn came down to the pad and spent the morning with Ritland and his team. "We reviewed with Gilruth [Dr. Robert R., Director, Manned Spacecraft Center, NASA, Houston] and the whole gang A to Z to see where we stood. We were just as critical as the devil. We had to have every pound of fuel in that thing or he would not make orbit. I can remember clearly that, when we got all through with the presentation, we asked John Glenn, 'How do you feel about it?' He said, 'If you guys say it's okay, it's okay with me.' And away we went."[59] A photo in the Ritland family collection of Glenn with a group of engineers and a sign behind them reading "MA-6 Readiness Status" is inscribed to Ritland, "Best regards to Gen Ritland—this was a good day—everything 'go'—and many thanks for all your help. [signed]

J.A. Glenn, Jr." Another photo of the liftoff of MA-6, dated May 19, 1962, is inscribed, "Best regards to my friend Maj. Gen. O.J. Ritland and many thanks for all the fine help—[signed] J.A. Glenn, Jr."[60]

Recalled Glenn about his flight, "It is difficult for the human body to judge the exact frequency and amplitude of vibrations [during launch], and I was not sure whether we were approaching the top limits that ASIS was set for or not. As it turned out, the capsule was under aerodynamic pressure of 982 pounds per square foot during this phase of flight. This was well within limits, and we made this hurdle, too."[61] Ritland stated at the post-mission press conference that the flight "was certainly a perfectly beautiful shot. . . . But more importantly, from a scientific and technical point of view, it was still more beautiful and wonderful." The only hiccup during Glenn's mission from Ritland's point of view: The pen on the mission plotter "bobbled a little bit" during launch. From his perspective, the team of Air Force engineers and their contractors at General Dynamics (formerly Convair), Rocketdyne, General Electric, and Burroughs all did a marvelous job. "I feel certain that it was this tremendous effort by all of the people responsible for the booster operations that attained this success today, and we certainly are proud of every one of our people who participated in this area."[62] Several Mercury missions followed until the last Mercury-Atlas combination finally launched May 15, 1963, with Gordon Cooper's Faith 7. The 34-hour mission covered 22 orbits and set the agency on a good path into the Gemini program.[63] It was time to move on to Gemini.

Some years later, members of the Ritland family watched the movie "The Right Stuff." According to grandson James "Jay" Montoya, "It was then that I knew he was somebody. The movie would be paused and Grandpa would explain what really happened. The movie was interest[ing], but Grandpa made it come to life. The way he spoke with passion about what was going on then and the clarity in the way he told it made it seem like it just happened yesterday. It is not every day that you get to experience history like that with a first hand account."[64]

The Mercury program only started a journey that, after President Kennedy's May 1961 speech, was going to end on the surface of the Moon. Before that Giant Leap, however, NASA had a lot to learn about long-duration missions in space and rendezvous and docking, among other tasks, which were going to be the goals of the Gemini program, so-called because two astronauts were in the capsule now. NASA had decided that lunar-orbit rendezvous was the approach they wanted to take to land astronauts on the Moon, a method that required a minimum of two in-space rendezvous and docking maneuvers, including one while orbiting the Moon itself. The agency knew that learning and practicing those techniques, among others, in Earth orbit made the most sense. But the new two-person spacecraft, Gemini, was twice the size of Mercury and needed a bigger booster than Atlas. While the one-person Mercury capsule weighed about 3,000 pounds, the two-astronaut Gemini capsule weighed over twice that. NASA needed a launch vehicle to replace Atlas. There were two options: the USAF's Titan II ICBM or NASA's own Saturn I.

Although NASA's booster contractor, AFBMD, had been working on a new version of the Titan ICBM, there were some issues that made it unsafe for astronauts to ride. The biggest problem NASA cited was the tendency during a Titan II launch for the rocket to bounce up and down during ascent, a phenomenon engineers called "longitudinal oscillation," but which was also called "pogo." Each of the 17 Titan II test flights through 1963 had displayed pogo, adding an extra force to the payload of plus or minus one-third the force of gravity, which might not seem a lot, but when added to the six g's astronauts were already experiencing, they were dangerous. The astronauts could experience g-loads from 5.7 to 6.3, which is really a wide swing back and forth of more than half the force of gravity up and then down and then up again 10 or 11 times per second.

The Air Force, however, was not interested in making changes in the missile to make it a human-rated space booster because it did not want to jeopardize the purpose for which Titan II was really being built—hurling nuclear weapons, which did not care about pogo, across the globe. NASA was so desperate to get Gemini flying that it considered using the Saturn I rocket instead of the Titan II. Conversations in the Gemini Program Planning Board did not go well until General Schriever eventually stepped in. At a meeting in Los Angeles of the missile division, the space division, and the Titan contractor Martin, Schriever ordered fixes to the rocket that solved the pogo problem. The eventual solution was to put mechanical accumulators on the fuel lines, along with new oxidizer standpipes and different materials in some places, which reduced pogo to just ±0.11 g, with which NASA was comfortable. But along the way, according to NASA administrator James Webb, engineers were able to make "major improvements in electrical circuit design, in electrical soldering and welding techniques, in assembly procedures and in test specification."[65]

On March 23, 1965, when Gus Grissom and John Young finally roared into space aboard the first crewed Gemini mission, Gemini III, "the nearest thing to pogo" they had "came just prior to booster engine shutdown," when according to Young, they "had a low-amplitude vibration of about 20 cycles per second," which was manageable for the rookie astronaut, whose job was to watch the instruments and monitor the trajectory. Recalled Young in his memoir, "As the forces built up to more than 7 g's, you realized that you were really just along for the ride, because that baby was tearing along! You've really got a tiger by the tail! There's not much you can do at that point except go with the flow. You have a feeling that you're going in the right direction and that the vehicle is indeed going to get you there."[66] Gemini IV featured Ed White in the first spacewalk, and Gemini V was the "8 Days or Bust" mission. Gemini VIII was the first successful rendezvous and docking mission. By the time the Gemini program ended, not only had the United States pulled well ahead of the Soviet Union in the space race but NASA was on its way to the Moon.

But NASA wasn't the only US government agency interested in flying astronauts or the only human spaceflight program Ritland was involved in. The Air Force wanted to figure out what astronauts could do for the military, resulting initially in a program called "Blue Gemini" or simply "Gemini B." Ritland's SSD developed plans in February 1962 to use NASA's "Gemini hardware as the first step" in a program to develop "a kind of military space station with Gemini spacecraft as ferry vehicles." Ritland argued in April that "to preserve and strengthen the peace, we must be able to conduct in space the same kind of military operations we have learned to perform in the air during the last 50 years. We will best succeed in this objective when we make man as useful in space as he is within the atmosphere."[67] Ritland wanted a more active role in Gemini because he felt the X-20 Dyna-Soar program would not fly for at least two more years. Air Force Chief of Staff LeMay opposed another program like Blue Gemini that might threaten the X-20 program, which he saw as the future of long-range aviation for the Air Force, so Blue Gemini was not officially sanctioned. Civilian Pentagon officials also were "skeptical" of military men in space because it was not obvious what military people could do in space.[68] But people like Ritland argued that humans were essential for military space programs: "The ability of the trained human pilot to apply his judgment and skill to the functioning of automatic systems or to shift to other methods of operation when necessary is the biggest reliability factor that can be designed into space systems. Man is the essential ingredient in space."[69]

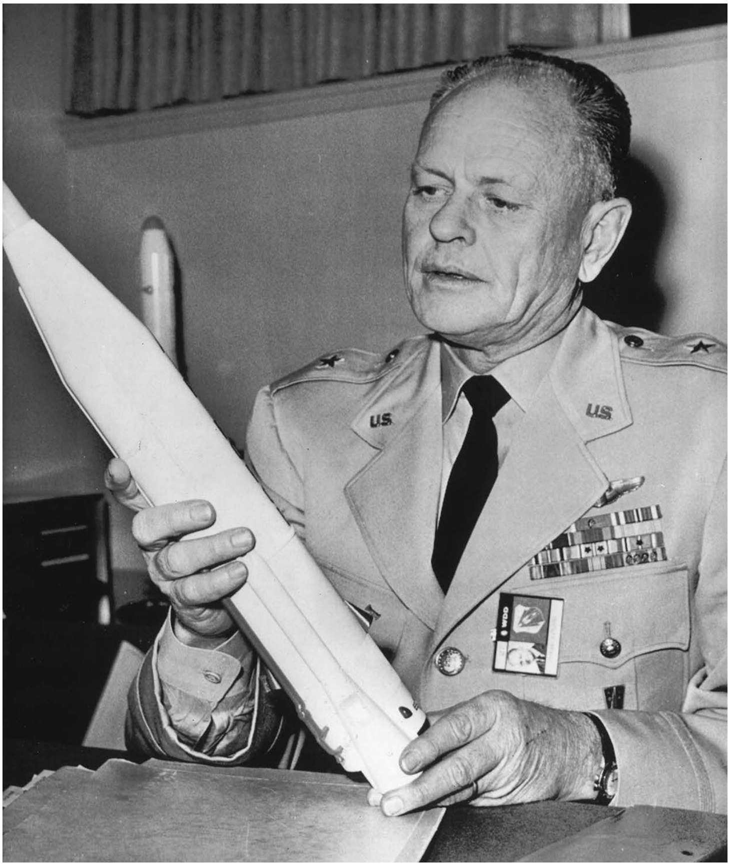

Fig. 11. Ritland holds a model of the Atlas rocket.

As more difficulties hit the X-20 and the satellite inspection programs, Gemini began to look even more attractive to Air Force planners like Ritland, who wanted to see if there really was a role for military astronauts. NASA, though, was generally supportive of Blue Gemini and even entered into an agreement with DOD in December 1961. Rather than fearing it would siphon off resources from their goal of reaching the Moon by the end of the decade or complicate the "peaceful" nature of their space program, NASA saw Blue Gemini as a useful addition. DOD was already providing the Titan II ICBM as a booster, and now NASA saw an opportunity to infuse additional military funds into its program. The two agencies also created the Gemini Program Planning Board, cochaired by NASA and DOD, as an advisory body on military experiments for Gemini flights. This board became more important as the Gemini program continued and the Air Force refined what it wanted for its human spaceflight program.[70] In Schriever's estimation, Blue Gemini would use "75% of the design and engineering developed by the NASA, and 85% of the flight and operations experience. Approximately 40% of the Gemini B aerospace ground equipment hardware requirements can be met from equipment becoming excess to the NASA Gemini Programme [sic]—a large dollar saving."[71]

Both NASA and Air Force Systems Command had wanted a single person to act as a go-between on the bigger issues facing them both.[72] Schriever simply could not attend all the meetings he had to with NASA and run all of Air Force R&D and procurement at the same time. Secretary of the Air Force Eugene Zuckert requested DOD assign an Air Force System Command liaison office to NASA HQ in December 1961. It received approval from McNamara in April 1962, though it was not until May 1962 that General Ritland assumed his new duties at NASA headquarters. Ritland was simultaneously DOD's liaison to NASA and Deputy Commander of Air Force Systems Command for Manned Space Flight and, starting May 15, 1962, "responsible for all U.S. Air Force actions involved in the national manned space effort."[73] He was given "broad responsibilities for the manned space flight effort, and for coordinating all USAF manned space flight activities with NASA."[74] Schriever gave him an office at his Andrews AFB headquarters and a staff of about 35 officers. This team of senior military officers worked directly with NASA spaceflight centers and worked directly with the NASA Office of Manned Space Flight. Ritland was supposed to be the focal point for all space activity in Systems Command and to be the Air Force's link into NASA.[75] Ritland described his responsibilities as "staff management and direction of all tasks assigned to the Systems Command in connection with military space programs, booster developments, and space program support; formulation of Command policies for space activities and programs; and the programming and allocation of Systems Command resources necessary to accomplish these tasks." Most airmen would call it "flying a desk," which is almost never what they would rather be doing. But Ritland also had an office at NASA Headquarters in DC where he worked with its Office of Manned Space Flight director, Brainerd Holmes, to coordinate USAF support for NASA's human spaceflight programs. Ritland also managed the officers who were detailed to NASA under interdepartmental agreements.[76]

Schriever wanted some insight into what NASA was doing with the national human spaceflight program, including its use of substantial Air Force resources. The military was providing NASA with knowhow on the Atlas and Titan boosters for the Mercury and Gemini programs, respectively. Ritland recalled,

> In reality, my job was to be the staff monitor of all of the space activities that the Air Force was interested in and to support the now official organization, outside of the Air Force, of the reconnaissance programs. I essentially had the responsibility to work with NASA in the support of the manned space program, working with the Under Secretary of the Air Force in their special programs, and working with the Air Force and the Space Systems Division at BMD. . . . I also had the responsibility to further the command and control of the network up there at Sunnyvale, which was an Air Force responsibility, and to pursue the development of the Titan III which was the base space booster. The Titan III-C was designed and developed for large space operations, and of course, was going to be identified later on as the MOL [Manned Orbiting Laboratory] booster launcher.[77]

In Ritland's estimation, the Air Force was "theoretically supposed to be in the manned space program, but we weren't; we were not in it. We were supporting the program because of our capability in the Atlas booster. In reality, the space program was really coming to the forefront. That includes the so-called reconnaissance programs which were expanding at that time. We had communications satellite programs, weather satellite programs. So it looked like the Department of Defense was going to get heavily involved in certain kinds of supporting space programs required by the military."[78]

Most DC assignments are not easy, but people make or break the work environment. This one was no exception. Ritland said, "The only [disappointment] was the attitude of some of the people. I'm talking specifically of Low [George M., NASA Apollo Spacecraft Program Office manager] and Shea [Joseph F., Low's predecessor and then deputy in NASA's Office of Manned Space Flight]. Joe Shea later on left. It's typical of government agencies though, distrust between government agencies, and I guess that's human nature. No flap was made out of that because anything I wanted to know I got."[79]

Ritland had worked with NASA's Holmes before, which probably made the transition and their work a little easier. An electrical engineer, Holmes "was considered both a brilliant thinker and a strong administrator who could organize complex engineering and construction programs." He had managed the USAF's $1.3 billion BMEWS design and installation of its football-field sized radars in Alaska and Greenland in the 1950s for RCA. He took a cut in pay of over half his salary to work at NASA and was overseeing the Mercury program when Glenn flew in February 1962. (George Mueller took over from Holmes, who "abruptly resigned" in July 1963 over NASA Administrator James Webb's "meddling" in human spaceflight programs.)[80]

The NASA Directorate of Manned Space Flight, which had been established in November 1961, was divided into six divisions: launch vehicles and propulsion, spacecraft and flight missions, systems, aerospace medicine, program review and resources management, and integration and checkout. Ritland set up his new organization to parallel their NASA partners, creating directorates of the same names, though systems engineering was more precise for one and checkout and ground support equipment was more precise for another. From these divisions, he could plan, budget, and coordinate the USAF resources needed to support

NASA programs. For example, the USAF and NASA shared test facilities for propulsion development, which had to be coordinated and planned to meet the goals of both agencies. Ritland also had four directorates at AFSC headquarters that were exclusively focused on the military's human spaceflight needs.[81]

Ritland's most public role in the NASA world was to serve as the Air Force's representative on the Manned Space Flight Experiments Board (MSFB). Associate Administrator for Manned Space Flight George Mueller chaired the board, whose members included Bob Gilruth, William Lovelace, George Low, and Wernher von Braun. The board's charter was to recommend which "experiments" should be sent on launches carrying astronauts. Considering NASA and the Air Force were just beginning to figure out what could be done in space, particularly by astronauts, "experiments" meant "an investigation which is not essential to the development, launching, navigation, or recovery of the space vehicle or spacecraft."[82] The board decided which experiments could fly and on which missions.

Experiments normally were considered scientific, technological, or medical, and any NASA center or the DOD could propose experiments. DOD experiments had to go before the board too, and the board decided if it would be "feasible to fly the experiment." But in the priorities of getting experiments and tasks completed on Gemini and Apollo missions, DOD requests were always considered at least second behind the requirements of the Apollo lunar landing program. Tasks needed for Gemini first had to go before the NASA-DOD Gemini Program Planning Board (GPPB), which was established to reduce duplication of effort and which reported jointly to the NASA Administrator and SECDEF on Gemini flight operations. DOD was interested because it had aspirations for its pilots in space. If the GPPB recommended an experiment for flight, the MSFB still could reject it although in practice it did not.[83]

For example, when the board met in March 1964, members recommended approval of experiments for Gemini flights 2 through 7, including cardiovascular health, bodily fluids analysis, and a study of bone demineralization in weightlessness. DOD wanted experiments flown also. For example, "Visual Definition of Objects in Space" was to "investigate man's ability to evaluate and photograph objects in space" using a 35 mm camera adding 25 pounds of payload and taking up 0.6 cubic feet of space. The astronauts were to go through preflight training with the camera, use it in space in the cabin, and then debrief after the mission. Similar experiments were called "Visual Definition of Nearby Objects in Space" and "Visual Definition of Terrestrial Features." But at the board meeting in September 1964, the Gemini Mission Director William Schneider told the board that GT-5 could not handle all the experiments due to a lack of "stowage space" and recommended deleting the three DOD experiments. The board, including Ritland, okayed deleting the experiments but recommended someone figure out how to reduce the number and types of cameras and lenses for photography experiments. At the next meeting in November, Willis Foster recommended reducing "the number of experiments rather than degrade the equipment" because there were already too many "observational" experiments. A year later, in September 1965, he finally reported back that the Manned Space Flight Center in Texas had developed an all-purpose 70 mm camera with interchangeable lenses and film packs the astronauts could use. But it could not do everything, including not being able to do a "reflex view of the field . . . or experiments requiring large spectrographic plates," which were primarily requirements the DOD wanted for its needs.[84]

As a partial solution to the problem of protecting its satellites (see chapter 7) and as a way to prove that pilots could do missions in space, the Air Force proposed the unfortunately named Dyna-Soar program as a military weapon system. Both the Eisenhower and Kennedy administrations worried about the safety of American reconnaissance satellites and international recognition of the concept of freedom overflight through space. Overflight went away as an issue when the Soviets got their own reconnaissance satellites in 1962. But the issue of the safety of American satellites remained. According to historian Roy Houchin, the service reoriented the combination of three different studies into three different "stages" of development: (1) vehicle capable of aerodynamic, structural, and human factors of speeds over 10,000 mph and altitudes greater than 350,000 feet; (2) a manned reconnaissance vehicle; and (3) a "Rocket Bomber (ROBO)" capable of flying above 300,000 feet at 15,000 mph. (X-15 flew 4,000 mph and up to 250,000 feet. Vehicles need to be travelling about 17,500 mph to maintain orbit at 62 miles, or roughly 327,000 feet, the generally recognized "start of space.") The program "incorporated hypersonic technology for reentry after attaining orbit with an expendable booster. Air Force planners proposed to explore the feasibility of using these technological innovations as part of a conceptual test vehicle for research, reconnaissance, and orbital nuclear bombardment in an exoatmospheric force structure."[85] With the May 1960 shootdown of the U-2, Midas missile warning satellites on orbit, and the August 1960 start of orbiting photoreconnaissance satellites, there was concern that there were new vulnerabilities in US defenses. LeMay, in an effort to protect the Dyna-Soar program, argued for a "satellite inspection role."

The Air Force's argument was, as Lt Gen James Ferguson laid out in a 1962 Congressional hearing, that "man has certain qualitative capabilities which machines cannot duplicate. He is unique in his ability to make on-the-spot judgements. He can discriminate and select from alternatives which have not been anticipated. He is adaptable to rapidly changing situations. Thus, by including man in military space systems, we significantly increase the flexibility of the systems, as well as increase the probability of mission success."[86] To keep costs down and benefit from NASA's hard-earned knowledge, the Air Force proposed a program, initially called the Military Orbital Development System (MODS) in August 1962, that was going to fly Air Force astronauts on Gemini capsules to do Air Force tasks. Space stations were to "be placed in orbit to develop techniques for reconnaissance, interception and inspection of possible hostile satellites," according to a newspaper article written about a Ritland speech. The "space laboratories" would be constantly "remanned and resupplied by smaller craft shuttling between earth and space. The shuttle craft would resemble the Gemini manned capsules" that NASA was using. Ritland argued that "there are important potential military missions that are ideally suited" for human beings to do, emphasizing the need to track what the Soviet Union was doing in space. "We don't know too much about what they have up there—except what they tell us," he was quoted as saying.[87]

But SECDEF McNamara did not like the Air Force's crewed concept because he felt it duplicated NASA's program, and NASA administrator James Webb felt that the concept took away some of the "peaceful" character of the NASA program.[88]

LeMay opposed USAF involvement in Gemini because he saw it as a threat to Dyna-Soar. Ritland wanted the USAF involved in Gemini because Dyna-Soar was at least two years out. (It would later be cancelled completely.)[89] Dyna-Soar represented, as space historian David Spires wrote, "the first approved military spacefaring system, and the only one that initially included an offensive role. It kept the focus on manned military spaceflight and, most importantly, helped lead to the development of the Titan III, the 'DC-3 of the space age.' "[90] LeMay wanted the Air Force's participation in human spaceflight programs because, he wrote later, he was convinced that human "skill and experience will contribute to the reliability and effectiveness of military Space systems. Experience in the Mercury flights has supported that view, and the Air Force role in the Gemini program will provide an early source of new information on man's usefulness in Space. Certainly the X-20A type of vehicle [Dyna-Soar], by enabling a pilot to select a preferred landing site from the many available over a spread of thousands of miles, may have significant advantages over ballistic reentry."[91] LeMay's view, expressed by many in blue uniforms, was that space systems with humans aboard were superior to robotic ones, but to be fair, no one had really quite figured out yet what those advantages were. In the early 1960s, science fiction was still outpacing science fact.

Ritland was among those who espoused "the need for a man in space," which he expressed in a February 1963 lecture to the USAF School of Aerospace Medicine. He suggested two reasons for putting humans in space. The first was simply that "our culture is human centered; that machines, no matter how ingenious, are meant to extend human capabilities, not to replace them." The second reason for putting humans in space was that humans "have significant capabilities needed for complex space missions which can not be provided as well or at all by machines," using the X-15 and the Mercury programs as examples of the "superiority of the man-machine combination in terms of reliability and versatility." He acknowledged that there were still "numerous constraints and technical problems" to be overcome in "the greatest adventure men have ever attempted." Ritland also acknowledged what had been discussed since the beginning of the space race: "Somehow, it simply does not 'count' to send a machine to the moon; man himself must ultimately go there."[92]

Ritland also argued for a role in space for military people. "Some of the missions often mentioned are the interception of 'dark' or hostile satellites and the inspection and possible neutralization of them; and the repair of complex unmanned satellites and the rescue of stranded astronauts. . . . Two more sophisticated projects that would need men aboard would be a command, control and communication center located in space and systems to control and defend sectors of space vital to national interests."[93] (Many of these tasks are done today by spacecraft with no people on board.)

In late 1963, with an agreement on not staging weapons of mass destruction in space that eventually became part of the Outer Space Treaty, Dyna-Soar as a ROBO system also disappeared.[94] These were all political decisions unrelated to the technology of dynamic soaring because sometimes political decisions are more important than technological ones.[95]

In the wake of the cancellation of Dyna-Soar, Air Force space interests turned to focusing on what their pilots could do, historian Spires wrote, "in the controlled environment of a space laboratory. This laboratory would have no offensive capability but, rather, would conduct passive defense functions in keeping with national space policy. In the Manned Orbiting Laboratory, the Air Force at long last believed it would attain its man-in-space objectives, whatever they might be." To keep costs down, it relied on existing DOD Titan III boosters and modified NASA Gemini capsules. The "laboratory" was "approximately the size of a house trailer. . . . In the laboratory a two-man crew would conduct 'shirt-sleeve' experiments, such as pointing cameras, for a three-day period."[96] According to Spires, "Air Force leaders clearly considered the MOL the first step to a permanent place for military man-in space activities."[97]

Ritland wrote in late 1964 that MOL was supposed to "explore the needs of national security in the future. This program is designed to provide the means of determining man's utility in performing military functions in space." The pilots were considered "both as test pilots and scientific experimenters in space." The idea was to have the astronauts try to determine their ability on orbit to discriminate, evaluate, filter, and "dispose" of data, all tasks that they needed to perform in order to inspect, maintain, and repair objects in space.[98] The National Reconnaissance Office put it even more clearly: "The Manned Orbiting Laboratory (MOL) was a 1960s Air Force program with the ostensible mission to place military personnel in orbit to conduct scientific experiments to determine the 'military usefulness' of placing man into space and the techniques and procedures for doing so if the need ever arose." This was to be the public, U-2-like cover story for the program.

However, according to the NRO, "the actual, classified, mission of the MOL program was to place a manned surveillance satellite into orbit."[99] Louis Mazza, NRO's Chief Program Security officer, suggested NRO "admit we have a DOD manned orbital laboratory and its mission is to determine man's potential usefulness in space. This suggestion led to designating MOL as a hybrid program. Publicly, it would be acknowledged that MOL was to discover what man was capable of in space. This would be achieved with various experiments conducted in the MOL laboratory. However, MOL's reconnaissance objectives, and its ability to capture superior imagery, would remain top-secret."[100] (The NRO declassified MOL in 2015.)

This purpose for humans in space had been a theme for a while. Put simply, Ritland said, "If we conceded that man can go into space for extended peaceful missions, we must also admit that man go into the same environment for military purposes. We shall do a disservice to our nation if we neglect any opportunity to bolster our attitude of deterrence in the area where future military operations may be required."[101] In September 1960, Ritland had told an Air Force Association audience that "the first space soldier may be just a mechanic" because "the first economically justifiable job for man in space will be to repair satellites." The cost of building and launching satellites had gotten so expensive, Ritland said, that repairing them on orbit was "a good investment." But, Ritland pointed out, "This man also could inspect foreign satellites."[102] These people in orbit also could be used to fix a problem the early Midas infrared missile warning satellites had of sometimes confusing the sun bouncing off clouds for the plumes of ICBMs. Suggested journalist Philip Klass, “Human observers on orbital patrol could never make such a misjudgment,” hence the DOD tests aboard Gemini V in August 1965 mentioned at the start of this chapter.[103]

Fig. 12. This concept sketch depicts the Manned Orbiting Laboratory (MOL).

But civilian officials both inside and outside the Pentagon were having a harder time seeing any role for military people in space.[104] The Air Force was facing what Spires called a “a requirements paradox for military manned spaceflight projects.” DOD saw no reason to put military people in space and opposed development of Air Force programs. Military pilots could only participate in NASA-managed projects like Gemini. For the Air Force, though, Gemini did not provide necessary information on what military officers could do in space. Ritland "participated heavily in the formulation of the concept and idea of MOL." He took the program up to the Air Force secretary and advocated for it, "adamantly interested in it," because it was "kind of the ultimate" in some of programs that he had been involved in.[105] "I remember, when I was in Washington, for example, on the MOL program, certain . . . people [in the Pentagon's office of research and engineering] wanted to support the MOL program. We would sit and talk in the Pentagon until eight o'clock at night on ways to sell it, to encourage the procurement of such a system."[106] The point of the program was "to assess the effectiveness of man in space from a military viewpoint," Ritland argued. "I intuitively feel that man will indeed prove to be of great military value in space, but we do not intend to undertake manned systems development until it is determined that specific military missions can be performed more economically or more effectively in this manner. . . . With the MOL program we will actively explore potential applications of manned space flight to meet national security requirements." This was an admission that the military did not really know what humans could do for national security in space. But he did see MOL as "a mandatory requirement."[107]

Secretary McNamara's 1965 comments on the MOL, Spires wrote,

> reveal both his skepticism about manned spaceflight and his concession to the Air Force: "This is an experimental program, not related to a specific military mission. I have said many times in the past that the potential requirements for manned operations in space for military purposes are not clear. But that, despite the fact they are not clear, we will undertake a carefully controlled program of developing the techniques which would be required were we to ever suddenly be confronted with. . . [a] . . . military mission in space." In effect, the Manned Orbiting Laboratory would become the new military manned spaceflight "building block."[108]

That was sort of the point the military was making to the public—use MOL to figure out what military missions could be performed in space. In 2013, the Air Force defined its "core missions: (1) air and space superiority; (2) intelligence, surveillance, and reconnaissance (ISR); (3) rapid global mobility; (4) global strike; and (5) command and control."[109] However, these missions were already being looked at as missions to do in space as early as people could think about military uses of space, dating back to the 1946 RAND report on the possible uses of a "World Circling Spaceship."[110] By the 1960s, according to historian Adam Gruen, "The general idea was to extend traditional Air Force missions into space: surveillance and reconnaissance; interception; bombardment; and command, control, and communications (C3). Of these general categories, interception and bombardment were better suited to an object that could easily change orbits, namely a space plane. Originally, interception referred to satellite interception. Once you start thinking along these lines, however, a whole range of tactical space missions opens up: for example, inspection of enemy assets, and combat space patrol to intercept enemy interceptors. It gets pretty complicated and presumably would follow the evolution of aerial warfare in the twentieth century."[111]

But no one in the US Government wanted to open a new battlefield to "follow the evolution of aerial warfare" into space. The "destabilizing weapons system" of an aloft space-based bomber was not considered an appropriate way forward, and DOD cancelled the X-20 in 1963. That left surveillance and reconnaissance and C3 as unaggressive missions the military might perform with people in space.[112] It was also quickly becoming obvious, through the advances in satellite communications, that a crewed communications satellite was not sensible, especially as engineers figured out that robotic communications satellites work efficiently at geosynchronous altitudes, which were farther away than any astronaut was sent until 1968's Apollo VIII mission, and did not need humans on board. That left surveillance and reconnaissance.

In the early 1960s, using satellites to take pictures from space was still a new technology. The Corona reconnaissance program only had a handful of successful missions under its belt by 1962. The structure of the program, which launched satellites into space with cameras and then ejected the film back to Earth where it was caught by an airplane over the Pacific Ocean, meant the photos were not very timely. The film was invaluable for studying the trends the USSR was making—strategic reconnaissance—but not very useful for immediate needs—tactical reconnaissance. The military wanted MOL to fill that gap. Astronauts could radio to the ground what they were seeing or, if the technology advanced far enough, transmit scanned photos of their observations from space. As MOL pilot Richard Truly recalled, "The idea was humans could help pick targets in real time, they could identify cloud cover and save film. The system was resource-limited because it was a film system, not electronic like we have now. But the whole idea was to have a far more capable intelligence capability because you had people there that could think and act and take action in real time during the flight."[113]

Schriever himself eventually became titular head of the MOL program office, reporting directly to the Secretary of the Air Force. Schriever had a one-star vice director of the program in DC and a one-star deputy director of the program in Los Angeles.[114] By mid-1965, MOL had become part of the classified national space reconnaissance effort. During 1964, DOD had added two reconnaissance tasks involving radar and camera assembly and operation in space. In addition, the MOL launch site shifted from Florida to Vandenberg Air Force Base, California, according to Spires, "to conduct high-inclination launches needed for intelligence collection over Soviet territory. With the additional requirements for inspecting non-U.S. satellites when they passed in view and for ocean surveillance to meet naval concerns, the Defense Secretary found the MOL sufficiently important."[115] According to author Don Pealer, the proposed "experiments covered the spectrum of potential military applications: early warning; ballistic missile defense; satellite detection and inspection; maintenance, repair and operation; reconnaissance surveillance of the land and sea; and nuclear test detection."[116]

Schriever saw MOL "as one part of a large and varied space effort." It was part of the military's overall space effort and part of the civilian space effort represented by NASA. He did not want to see the national space effort divided into "peaceful" or "nonpeaceful" elements because "all of our space programs serve peace, either through helping deter aggression or through yielding scientific, technical, and economic benefits." Four elements crucial to MOL's success were "proper motivation, adequate technology, skilled management, and high-caliber people." In a speech, Schriever said, "As we move ahead with the MOL program, we will greatly increase our knowledge of man's capabilities in orbit. In doing so, we will be helping to lay the groundwork for the next steps our nation may be called upon to take in space."[117]

On August 25, 1965, President Johnson announced approval of MOL for "full-scale development" and a budget of $150 million. "The project involved three main contractors: Douglas Aircraft would be responsible for the laboratory canister, McDonnell Aircraft the Gemini capsule, and General Electric all space experiments."[118] (Douglas and McDonnell merged in 1967. Ritland started working for McDonnell in 1966.) The Air Force had finally received the "opportunity to justify the military potential of man in space." The service was "confident that, although MOL [was] a laboratory test bed, it [would] lead to an operational space station, manned by military crews and performing military missions and experiments."[119] Critics worried that MOL "would set off a new arms race in space" even though MOL was not "a weapons carrier" because its "primary purpose" was "observation of earth and sea from space, an activity indulged in by both the United States and the Soviet Union since the earliest days of manned flights of U.S. astronauts and Soviet cosmonauts."[120]

Reflecting the changes in requirements and the growth of the program overall, MOL had gotten bigger. According to historian Spires,

> The laboratory canister now measured 41 feet long by 10 feet wide and weighed 14,000 pounds, with the reconnaissance payload comprising 5,000 pounds of the total 25,000-pound system. Once in orbit, the two astronauts would move through a specially constructed hatch into the laboratory, where one section housed pressurized living quarters and the other the experiments section with the reconnaissance telescope. The camera's lens would measure six feet in width, with a resolution between six and nine inches depending on atmospheric conditions. After completing their 30-day mission, the astronauts would close the laboratory, move back into the Gemini

> B capsule, and separate from the canister for the flight to earth and an ocean recovery. The laboratory would be left to burn up on reentering the atmosphere. The Air Force expected to launch the first of five MOLs in early 1968.[121]

There was a lot of initial enthusiasm for the MOL program. One analyst reacted to the news of the program in this way: "Air Force plans to develop a manned orbital laboratory may well make the birth of a 'U.S. Space Force.' And last Tuesday, [December 10, 1963,] when the AF received the assignment, may become the official birthday."[122] (The actual US Space Force birthday is December 20, 2019.) Another author called MOL "one of the most revolutionary and promising projects ever undertaken" because "MOL's potential for improving reconnaissance, communications, and command and control activities is so great that it undoubtedly will give a big boost to U.S. capabilities for mounting global logistic operations and responding to limited-war challenges, as well as strongly supporting the arsenal of strategic weapons," even if it was not clear how all these functions could be performed by two astronauts orbiting Earth in a cylinder the size of "a small office." It was practically obvious to the technical editor of *Air Force/Space Digest International* that "the evidence is strong that man will be so useful in space that his presence there will soon be classed as a necessity."[123] Schriever had argued to the National Geographic Society in 1958 that

> man, even with all the equipment he must take with him, will become the cheapest, lightest, and most practical "instrument" for obtaining and assessing that added data.
>
> Man is still the best all-purpose computer-servo system known. He as the equivalent of ten billion electron tubes in his brain—a capability infinitely greater than that of our largest electronic computer. When it comes to evaluation, reasoning, and interpretation of complex situations, man can't be surpassed. . . .
>
> Despite all our push-button technology, it is still the man that counts, and not the button.
>
> You can't design a circuit to take the place of courage. You can't enclose dedication to freedom in a magic box. No matrix of tubes and wires can give us leadership.[124]

Secretary of the Air Force Harold Brown tried to tamp down the enthusiasm when he testified before Congress in that "only complex tasks will require a man in space," which he described as "equipment assembly in space; flight-plan programming, which implies a considerable load in maneuvering rockets and fuel; and selective reporting of data," which were not tasks that could be done on the ground.[125] It should be apparent by now that the Air Force was still thinking of the roles humans could perform in space as pretty similar to what they already did with aircraft. As it turns out, assembling large modules of space stations does have to be done by astronauts in orbit, but large parts of what engineers thought might have to be done by humans in orbit can actually be done by robotic satellites in orbit or remotely from the ground.

Said LeMay in his 1965 memoir, "Our manned orbiting laboratory program is of paramount importance. That's not under the NASA; it's under the Air Force. We are planning to send up a small laboratory, and we will have people working in that laboratory. The successful multi-orbital trips made by our astronauts [Edward] White and [James] McDivitt in the early summer of 1965 were a part of this scheme."[126] On June 3rd, Gemini IV, in a mission better-known for the first American spacewalk, the "astronauts carried a modified (three-inch lens) version of the Hasselblad camera to test the practical ability and the clarity of hand-held photography from space. Despite the short focal length, the color photographs showed remarkable details." NASA liked the quality and detail of the photos so much that they planned to use the same technology in an upcoming Apollo flight to help determine a safe landing site for crewed missions.[127]

During late summer 1965's Gemini V mission, Cooper and Conrad again carried Hasselblad lenses, including a ten-inch telephoto lens. When something broke down, "The astronauts made repairs on equipment, most notably on a sighting device for enabling them to pinpoint targets in space and on the earth."[128] When the reticle sight, which projected a lighted circle on the target they were tracking, failed, Cooper completely disassembled the "extremely valuable and extensive photographic and ultraviolet/infrared emission" equipment, troubleshooting the problem down to a "fraying . . . auxiliary power cord inside a receptacle on his side of the cockpit," preventing electricity from reaching the equipment. Swapping out the cord with a similar one on the other side of the capsule, he eventually reassembled the cameras and got back to work. The repair task took about 13 hours because it was constantly interrupted by other mission tasks. This was "believed to be the first repairs accomplished during a manned space mission by U.S. or Russian astronauts involving disassembly or removal and replacement of parts."[129] The astronauts were demonstrating that they could survive on their own in space. Conrad also used a commercial camera lens known as a Questar, modified to fit into the Gemini capsule. Conrad said while passing over the runways, taxiways, and buildings of Dallas's Love Field, a "9,000-foot runway up here fills the whole lens up."[130] *LIFE* magazine published several of the photos they took from orbit in the September 24, 1965, issue, which were the "Most Remarkable Views of Earth Ever Recorded," including a two-page spread of Cape Kennedy from 100 miles up and pictures of parts of Morocco, Iran, Egypt, and even China and the Tonkin Gulf.[131]

Ritland was not the only airman who saw MOL as an important task. Schriever obviously did and none other than aviation pioneer Benjamin Foulois did, too. In Foulois's 1968 memoir he wrote,

> The Manned Orbiting Laboratory (MOL) program of the Air Force is, in my opinion, the key to future military space operations. It will provide answers to many of the unknowns about man's ability in space—answers from a defense viewpoint. I think it is possible that space systems may prove to be the most economical and effective way to perform several basic military missions. For example, a laser-beam weapon operated by a man might be used with great precision, like a surgeon's knife, to cut out enemy military installations with little damage to nearby towns. The space pilot, on routine patrol, will be able to inspect a potentially dangerous enemy satellite, neutralize it, and report the threat to earth. He will be able to spot future trouble as it begins to develop on the ground such as unusual deployments of ships, submarines, planes, missiles, or ground forces. This kind of information, received early enough, could help ward off international crises such as the Cuban crisis of 1962.[132]

The likes of Foulois, who had first flown in 1909, mentioning MOL and LeMay, so closely associated with nuclear bombers, mentioning human spaceflight in their memoirs indicates how important the Air Force saw pilots in space.

By summer of 1965, the Air Force was ready to select astronauts for the MOL program. Ritland helped select the crews, who would eventually be known as “MOL pilots,” to distinguish them from NASA astronauts, although the military just referred to themselves as “flight crew.”[133] Lachlan Macleay recalled later, “I didn’t volunteer to get on the list. In other words, there was, to my knowledge, no open application process to get on MOL.”[134] Applicants needed to be graduates of the Aerospace Research Pilot School, as test pilot school was now called.[135] Ritland recalled what happened with the military astronaut selection.

> As a matter of fact, Schriever and myself, we took an aggressive attitude on it. We selected astronauts just to get the lead, contrary to the Air Staff’s and [Chief of Staff’s] approval. Schriever directed me to set up my own selection board, and we selected the first MOL astronauts, to include a Navy guy and [five] Air Force guys, under the general ground rules. We gave them the whole works—physical exams and everything—and selected them and identified them. Later on, I guess, the Chief and the Air Staff got irked that we’d selected the astronauts for the MOL program without the blessing of the Chief and the Staff. So they didn’t like it and more or less nullified the selection. However, I saw to it that we did a thorough job because I had been through the selection of pilots for the U-2 program. So I was not going to leave any stone unturned. So we went thoroughly and completely into every aspect of it. I had recognized, qualified people participating in the selection board. It wasn’t just one guy; it was a full board. Yeager [Brig Gen Charles E.] was on it, and Harry Evans [Maj Gen]. I don’t remember everyone, but anyway, it’s all documented. After the Air Force decided they wouldn’t approve it, they looked at the procedure that was used and saw they couldn’t improve on it. One thing they did was knock one guy out because, during the interim period, there was a selection board for promotion from captain to major or something like

> that. Lo and behold, this individual was not selected for promotion, but he·was selected to be an astronaut. I guess from a psychological point of view, if a guy can't be selected for promotion, there's something wrong with him, and he isn't qualified material for an astronaut. So he was dropped, but the rest of the guys were approved by the Pentagon and did, in fact, go into training; did, in fact, come out to SAMSO and did, in fact, start working on the program. They began to participate in the technical aspects, and were there until it was cancelled. Later on, some of them went to NASA, I think, two or three of them. One of those little guys—Truly—was one of the communicators on the Apollo program. I guess some of them are still there, two or three of them.[136]

The board selected 17 pilots in three groups for the MOL program. The first group, whose selections were announced on November 12, 1965, just three weeks before Ritland's retirement, consisted of eight test pilots from the USAF—Michael J. Adams, Albert H. Crews, John H. Finley, Richard E. Lawyer, Lachlan Macleay, Francis G. Neubeck, James M. Taylor—and the Navy's Richard H. Truly. Crews had been a Dyna-Soar pilot. The second group was selected in 1966 and included five pilots: Karol J. Bobko, Robert L. Crippen, C. Gordon Fullerton, Henry W. Hartsfield, and Robert F. Overmyer. The third and final group of four pilots, chosen in June 1967, was James A. Abrahamson, Robert T. Herres, Robert H. Lawrence, and Donald H. Peterson. Lawrence was the first African American selected to be an astronaut by any national space program. He died in an F-104 Starfighter crash six months later in December.[137] The pilots were all in the O-3 or O-4 military paygrades and averaged just over 30 years old. Several of the MOL astronauts became NASA astronauts and eventually flew in space. A few made general officer rank, as well, like Herres, who served as commander of Air Force Space Command and the first commander of United States Space Command, eventually retiring after serving as the first Vice Chairman of the Joint Chiefs of Staff.

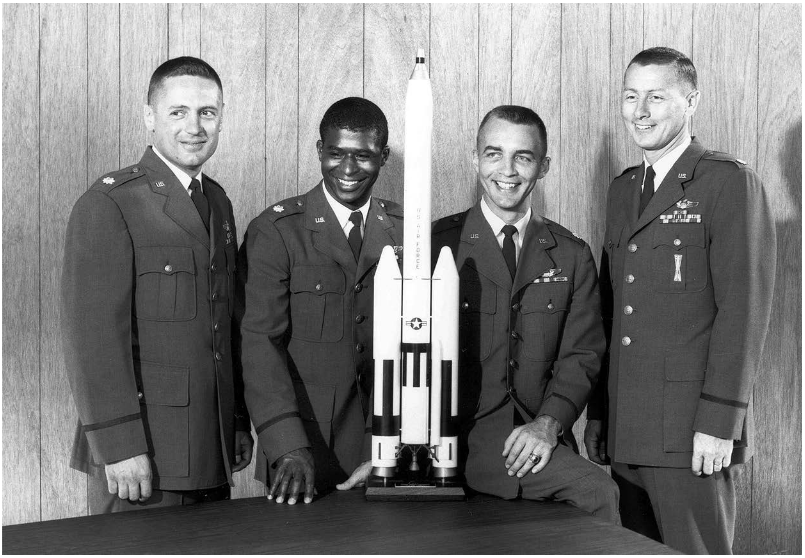

Fig. 13. Astronauts Robert T. Herres, Robert H. Lawrence, Donald H. Peterson, and James A. Abrahamson were the third group chosen for the MOL mission.

Oddly, because of the classification of the program's actual purpose, none of the MOL pilots knew what they were getting into until after their candidacies were announced and they got their security clearances for the program. James Abrahamson, who went on to be a lieutenant general and run the Strategic Defense Initiative program during the Reagan Administration and was selected in the third group, explained, "The first part of it was to get introduced to what real classification was and, secondly, what the satellite surveillance program was, then what MOL was going to be about." Truly recalled of the experience,

> It was one of the most amazing days of my entire career because we got briefed on all these code words, Dorian and Gambit and Hexagon, TK, all these different code words. Every view graph was covered with them. And of course at that time, the NRO was covert, none of these organizations existed. None of the programs existed in the public eye. And yet they were doing great things. It gave me great confidence in the United States that they could pull off such an enormous

> technological effort and still be invisible. It didn't exist. It was amazing . . . . It was an introduction not to one but to two space programs: the public, what the public knew and astronauts and all that jazz, and then this other world of capability that didn't exist.[138]

When asked if the MOL candidates would train as the NASA astronauts did, Ritland replied, "Well, they were headed for it." The plan was for them to get same type of training as the astronauts in Gemini and Apollo and to use Gemini simulators.[139] To begin, all MOL crewmembers attended the Navy dive school in Key West, Florida, where, according to the NRO, "playful competition between the Navy and the Air Force ensued." Baltimore Colts head trainer Eddie Brock gave them "professional athletic training to ensure they were at their best physically during visits to the Apollo simulator in Baltimore, Maryland. Occasionally, the crewmembers would even meet some of the Colts players during training sessions and play handball with them." Perhaps most importantly, they received training "from the National Photographic Interpretation Center where they learned more about photographic intelligence and subject recognition."[140]

It was not just these test pilots who were training to become astronauts. The Air Force was also detailing young officers to NASA to learn about human spaceflight from the only agency actually doing it. Previously, NASA had borrowed senior military leaders to provide their experience in managing key elements of NASA programs. For example, in late 1963, Schriever sent Maj Gen Sam Phillips, who had been the Minuteman ICBM program manager, to NASA to run the Apollo program. The idea now was to send more junior officers to NASA for "on-the-job training in manned space flight operations," according to one trade journal article. On top of the hundreds of military officers already assigned to NASA, this first group of 128 officers as junior as lieutenant were detailed to NASA's Manned Spacecraft Center in Houston to work in spaceflight operations and crew operations for at least two years.[141]

But from the beginning, MOL was tough to work on. Civilian leaders in DOD and at NASA believed MOL was complicating international and domestic politics, so Ritland had to maneuver the bureaucratic politics of interagency work in Washington. "I had a couple of occasions with Bob Seamans [Secretary of the Air Force] being reluctant to authorize military experiments on the Gemini program, minor things like cameras, photography business. We spent some $16 million and had to fight to get some of them in the program, but he was protecting the so-called nonmilitary aspects of NASA's effort."[142] It is interesting that in the portion of his autobiography covering his time as Secretary, Seamans mentions eight projects that required his monthly review, but only one was a space program, the infrared missile warning satellite known then as the Defense Support Satellite.[143]

Anxiety in the Air Force began to rise further as NASA talked about starting its own space station using equipment that it expected to have left over after Apollo. Lt Gen James Ferguson, USAF, Deputy Chief of Staff, Research and Development, suggested to the Air Force Vice Chief of Staff, Gen William McKee, that to compete with NASA, the Air Force needed a higher-level interface for "top level coordination with such groups as Secretary McNamara's staff, Congress, etc." McKee approved a request to make the Air Staff in the Pentagon the "focal point to coordinate with NASA on plans for development of the national space station. Col Kenneth W. Schultz was named to head the new office, which was seen as paralleling the arrangement within DDR&E's office. Besides working with NASA, Colonel Schultz was given responsibility for managing USAF space planning studies and coordinating with the Army, Navy, and other governmental agencies."[144]

Air Force Undersecretary Dr. Brockway McMillan said the reorganization was "a timely organizational step," writing McKee "that it might also be appropriate to give the new Deputy Director the job of reviewing proposed agenda items for the monthly space station reporting meetings with NASA, controlling USAF attendance, and reviewing all Air Force space briefings intended for the space agency. Advising that while he did not intend to downgrade General Ritland's role as AFSC Deputy Commander for Manned Space Flight, he thought Colonel Schultz should be responsible for keeping him informed of all significant space station data exchanges between NASA and the Air Force."[145] Soon the Air Staff decided that its new space office should have "authoritative review over exchanges of space station data between the USAF and NASA." It also would be responsible for all correspondence about official USAF positions or policies, and handle coordination of NASA studies." Lt Gen James Ferguson, the USAF chief of R&D, "directed General Ritland to submit to the new office a monthly status report on all AFSC space station study activities."[146] General Ritland had been bureaucratized out of a role coordinating between NASA and the Air Force on space station issues. His role in the Gemini program and human spaceflight continued, though.

Ritland had also learned through his NASA connections that the civilian space agency was beginning to think about its post-Apollo future, even as early as 1964. Through formal and informal agreements between the Air Force and NASA, the two agencies were working well together. The Gemini program was proceeding successfully, and astronauts were learning a lot of skills they needed to make a successful Moon landing by the end of the decade. The Air Force was also learning a lot from NASA and using the Gemini program as the basis for the MOL program made a lot of sense. But NASA also was beginning to think about a space station of its own, threatening MOL and, to the Air Force, seeming like it was violating "the January 1963 Gemini agreement [that] stated that neither agency could initiate a major new manned space flight program in the near-earth environment without the other's consent."[147] On March 5, 1963, Ritland informed Schriever that "NASA had greatly intensified its contracting efforts and was planning to spend several million dollars for space station studies during fiscal year 1964."[148] After some bureaucratic back and forth, NASA's Jim Webb informed DOD that NASA was doing what it was supposed to, performing its "statutorily assigned functions" and looking ahead "to insure U. S. leadership in the field of space science and technology."[149] But Webb agreed that the two agencies should work together. Ritland "believed some kind of centralized management of planning for development of a space station was required."[150] The two agencies eventually formed the "Manned Orbital Test Station Program Planning Group" and began to share what they were working on. Eventually they went in very different directions.

In the end, though, despite some technical successes, MOL was a victim of its times. According to Spires,

> By 1968 more than technical challenges threatened the future of the MOL. In the latter half of the decade, the escalating financial burden of Vietnam and the domestic "Great Society" social agenda diminished support for the national space program across the board. Both Defense Department space programs and Project Apollo suffered reduced budgets. In the competition for scarce resources, space generally and the MOL particularly became convenient targets for the budget cutters. Space represented a sizable twenty percent of the Defense Department's research and development budget. Of the Air Force budget, astronautics programs comprised one third of the total, and half of this involved the MOL, the costliest project unrelated to the war [in Vietnam] in the Air Force budget for research and development.[151]

Air Force Secretary Seamans, who understood spaceflight operations and requirements, nonetheless pointed to the shortcomings of conventional forces and the important requirement for F-15 fighters, C-5 transports, and an upgraded air defense posture, saying, "The cost of a manned [space] system is too great to be borne at this time." The Air Force, he said, needed to focus on modernizing its tactical and strategic forces rather than worry about future space capabilities.[152]

In June 1969, the new Nixon Administration cancelled MOL outright. New SECDEF Melvin Laird said that during the period of MOL's development, robotic satellite systems had proven their usefulness in communications, navigation, meteorology, and—although he did not say it—reconnaissance. "As Secretary Laird reaffirmed shortly thereafter, 'these experiences as far as unmanned satellites are concerned have given us confidence that the most essential Department of Defense space missions can be accomplished with lower cost unmanned spacecraft.' The field of manned spaceflight now was left for NASA to exploit."[153] Other critics of MOL's cost said that "unmanned space systems could perform the MOL's experiments just as effectively at lower cost" and without duplicating what NASA was working on, a large space station that eventually became Skylab.[154] Ritland chalked up MOL's cancellation to "political problems that were insurmountable. I'm not sure what caused it to be cancelled, but I think it was government politics, requirements, political controversy, and problems. I'm talking about international politics, which are difficult to analyze and cope with."[155] In November 1966, the Air Force used a Titan IIIC to launch a successful test of a smaller, simulated Gemini capsule that included nine on-board experiments, the only official MOL test launch.[156]

Another way to look at the lessons of MOL is, in the words of historian Gruen, "to concentrate on what you want to achieve and when you need to achieve it. Do not worry about where man will appear in the loop. That will emerge quickly enough if you understand what it is you want to do," for which of course the Air Force never made a convincing argument.[157] Or, as historian of technology Melvin Kranzberg suggested, "Although technology might be a prime element in many public issues, nontechnical factors take precedence in technology-policy decisions."[158]

In early 1963, Schriever got approval from Chief of Staff Curtis LeMay to do Project Forecast.[159] The project mirrored the report von Kármán delivered to General Arnold at the end of World War II, *Toward New Horizons*, that set the technological path for the air service. Schriever intended to have the same impact. With the work planned to be accomplished in just a few months, it was "a comprehensive study and analysis of the Air Force structure projected into the 1965–1975" timeframe by focusing on the "impact of science and technology on the future role of the Air Force" and coming up with realistic solutions at realistic costs.[160] Trevor Gardner also participated, although he unfortunately died during the project. Schriever relied heavily on the members of the Air Force's Scientific Advisory Board and on other leading experts in the Air Force like Ritland, bringing in experts from academia, think tanks, businesses, and the military whom he had met over the years, and eventually nearly 500 people representing all the military services, nearly 50 government agencies including NASA, 26 colleges and universities, 70 companies, and 10 nonprofits contributed to the study, which was mostly worked out at the old AFBMD stomping grounds in Los Angeles. Schriever tried to give the board "freedom to exercise their imaginations" while making sure they still met the needs of military missions and the realities of fiscal constraints.[161]

Ritland was chair of the intelligence and reconnaissance panel, which he said they broke down "into strategic, tactical, Army support, electronics, intelligence, and whatnot."[162] Although his role "was totally intelligence-oriented, and we had a group or team to present views on the intelligence aspect," he got involved in many of the other topics, too. But because of classification issues, Ritland's team did not consider space-based reconnaissance, only "aircraft and airborne types of reconnaissance and intelligence systems or the ground effort." He had members of eight major Air Force commands, members from the Joint Staff, and supporting military agencies working together over two months to produce what Ritland called a "compilation" of all the capabilities they had at the time and the needs for the future. In two reports, they stressed reconnaissance collection systems as well as sensor technologies that might be needed. They were concerned in the end with timely delivery of intelligence, in all kinds of weather, the survivability of systems, and their integration. At his team outbrief, Ritland linked policy and systems, particularly because the United States, which had been preparing for nuclear war with the USSR, was now in need of tactical reconnaissance, as illustrated by the Cuban Missile Crisis, supporting both the reconnaissance variant of the McDonnell F-4C Phantom II and a reconnaissance variant of the TFX, a two-person jet intended to meet the needs of all the military services and later called the F-111A. Significantly, the team suggested the needs for reconnaissance and intelligence needed to be focused system-wide by considering airborne and spaceborne platforms together, a pretty serious change for an Air Force wedded to flying airplanes.[163]

Ritland recalled the final outbriefs in October 1963 when SECDEF McNamara showed up: "The first thing [McNamara] did was take his coat off, and he sat there and went through the entire presentation of the effort which was several months, nearly six months of effort in studying, and we had people from industry, military, with no limitations. Everybody participated, and we had the most knowledgeable people in each of the areas."[164] One of the big issues was the follow-on to the B-52 bomber, but after the death of the XB-70 bomber, the next bomber would have to wait until the end of the Carter Administration. Ritland presented his section to

McNamara at an informal lunch while the secretary ate sandwiches in his shirt sleeves. But, possibly because of Ritland's work, the project endorsed further study into "a manned orbiting laboratory," which soon opened a project office.[165] Overall, McNamara saw the conclusions of the project as "extremely favorable." He spent a full day in Los Angeles with the team and, according to Ritland, "complimented Schriever on an outstanding job and said, 'This is what we need more of.'"[166] McNamara even held up submission of the DOD budget until some of Forecast's suggestions could be incorporated into the budget.[167] One Air Force historian said that "in an era of hard choices involving limited funding, high cost, and long delivery dates for weapon systems, *Forecast* painstakingly selected those technologies from which the Air Force could expect optimal returns for each dollar invested."[168]

According to one assessment of Forecast 20 years later, "Its conclusions turned out to be truer and timelier than anticipated. Project Forecast paid off handsomely and quickly. The technologies of aerodynamics, propulsion, materials, and sensors that it earmarked for special grooming led to, among other systems, the B-1 bomber, the C-5 transport, the Space Shuttle, and laser-guided and TV-guided weapons—all of them the products of the following decade."[169] Yet it is a sign of the significance of this approach that another report followed in the 1970s by the name New Horizons II, and in the 1980s Project Forecast II tried to project the Air Force into the twenty-first century.[170]

But, said Ritland, "there comes a time when there is a disappointment when you don't advance. So what you do is act accordingly. As such, I retired early, six years early, to take a job in industry to continue my effort and to make a little bit more money for my retirement. When I retired I didn't discuss my retirement with him [Schriever]. I just informed him that I was retiring. As a matter of fact, I already had a job and everything and just informed him that I was going to retire."[171]

It was time to head home to California.

Notes

1. L. Gordon Cooper Jr., interviewed by Roy Neal, Jet Propulsion Laboratory, Pasadena, California, May 21, 1998, 24.

2. Nancy Conrad and Howard A. Klausner, *Rocketman: Astronaut Pete Conrad's Incredible Ride to the Moon and Beyond* (New American Library, 2005), 139.

3. Barton C. Hacker and James M. Grimwood, *On the Shoulders of Titans: A History of Project Gemini* (NASA, SP-4203, 1977), 256 and 256n.

4. Gordon Cooper with Bruce Henderson, *Leap of Faith: An Astronaut's Journey in the Unknown* (Harper Collins, 2000), 119.

5. Pete Conrad, "We Had Our Orbit. It Was the Cat's Bandana," *LIFE* (September 24, 1965), 84C.

6. Conrad and Klausner, *Rocketman*, 141.

7. Hacker and Grimwood, *A History of Project Gemini*, 257.

8. Gene Kranz, *Failure Is Not an Option: Mission Control from Mercury to Apollo 13 and Beyond* (Simon and Schuster, 2000), 147.

9. Quoted in Kranz, *Failure Is Not an Option*, 147.

10. "Gemini 5 Sustains Accelerated U.S. Pace," *Aviation Week and Space Technology* (August 30, 1965), 24–25. The rocket sled had been used in tests to evaluate how many times the force of Earth's gravity a human being could absorb. When American flight surgeon Col. John Stapp subjected himself in 1954 to a few seconds of its 40,000 pounds of thrust, he reached 632 miles per hour, enduring 46 g's in just 3,000 feet. "The Man Behind High-Speed Safety Standards," *Air and Space* (August 22, 2018), https://airandspace.si.edu/.

11. Hacker and Grimwood, *A History of Project Gemini*, 258; Conrad and Klausner, *Rocketman*, 142; and "Gemini 5 Sustains Accelerated U.S. Pace," 25.

12. Quoted in Kranz, *Failure Is Not an Option*, 149.

13. Hacker and Grimwood, *A History of Project Gemini*, 258–59.

14. Cooper interview, 29.

15. Hacker and Grimwood, *A History of Project Gemini*, 259.

16. NASA, Press Kit for Gemini V (August 12, 1965), 68–70, http://mirror.heroicrelics.org/, accessed February 28, 2026; and Conrad and Klausner, *Rocketman*, 141.

17. Hacker and Grimwood, *A History of Project Gemini*, 259; and Press Kit for Gemini V, 71.

18. Charles "Pete" Conrad Jr., interview by Don Pealer, *Quest: The History of Spaceflight Quarterly* 8, no. 4 (2001): 54.

19. Hacker and Grimwood, *A History of Project Gemini*, 260.

20. Cooper and Henderson, *Leap of Faith*, 129–32.

21. Col. Paul E. Worthman, Memo to Commander, Detachment 2, Space Systems Division, Johnson Space Center, Subj: Review of Photography from DoD Experiments on GEMINI Flight 5, September 28, 1965, https://www.nro.gov/, accessed December 20, 2022.

22. "So Vast, So Beautiful, So Overpowering," *LIFE* (November 24, 1965), 30–39.

23. Hacker and Grimwood, *A History of Project Gemini*, 263.

24. Cooper and Henderson, *Leap of Faith*, 126.

25. Loyd S. Swenson et al., *This New Ocean: A History of Project Mercury*, (NASA, 1966), 255.

26. Ritland oral history, 267–68.

27. Slayton and Cassutt, *Deke!*, 78.

28. Swenson et al., *A History of Project Mercury*, 91; and Tony Reichardt, "First Up?" *Air and Space* (September 2000), https://www.smithsonianmag.com/, accessed March 7, 2023.

29. Swenson et al., *A History of Project Mercury*, 91.

30. Reichardt suggested that the names were simply a list of test pilots between 150 and 200 pounds who could be available for the MISS program. Encyclopedia Astronautica, an online encyclopedia of space topics, suggested these men were a "preliminary astronaut selection" for the MISS program and as such "the first preliminary astronaut selection in history." See "Man-In-Space-Soonest," astronautix.com (March 30, 2005), http://www.astronautix.com/.

31. Spires, *Beyond Horizons*, 75.

32. Swenson et al., *A History of Project Mercury*, 93–94, 114–16, 131–32.

33. Swenson et al., *A History of Project Mercury*, 175.

34. Swenson et al., *A History of Project Mercury*, 174–75.

35. "Astronauts Press Conference," September 16, 1959, NASA release 59-230, NASA Archives, Washington, DC.

36. "Astronauts Press Conference."

37. Slayton and Cassutt, *Deke!*, 78–79.

38. Donald K. Slayton, "A Job for Everybody," in M. Scott Carpenter et al., *We Seven* (Simon and Schuster, 1962; Giant Cardinal edition, 1963), 84–85.

39. Slayton and Cassutt, *Deke!*, 79.

40. Swenson et al., *A History of Project Mercury*, 178–79.

41. Swenson et al., *A History of Project Mercury*, 182.

42. "Report of Ad Hoc Mercury Panel," April 12, 1961, *Exploring the Unknown*, vol. 7, 178.

43. P. E. Culbertson, "Man-Rating the Atlas as a Mercury Booster," AIAA Support for Manned Flight Conference (April 21–23, 1965), 2–4, https://doi.org/10.2514/6.1965-252, accessed January 24, 2023.

44. Swenson et al., *A History of Project Mercury*, 175–76.

45. Swenson et al., *A History of Project Mercury*, 187–89; and Culbertson, "Man-Rating the Atlas," 6.

46. Swenson et al., *A History of Project Mercury*, 189–90.

47. Swenson et al., *A History of Project Mercury*, 255.

48. Culbertson, "Man-Rating the Atlas," 8.

49. Aleck C. Bond and S.A. Sjoberg, eds., "Post Launch Report for Mercury-Atlas No. 1 (MA-1)" (NASA, August 2, 1960), 1, https://www.scribd.com/, accessed February 28, 2026. Eventually, NASA figured out the adapter connecting the spacecraft to the booster failed when the rocket reached MAX-Q, the region of maximum dynamic pressure, and the Atlas broke up, the uncrewed capsule plummeting into the ocean. NASA recovered more than 95 percent of the capsule but did not meet its test objectives. For the capsule parts that were donated to the Smithsonian, see "Fragments, Capsule, Mercury MA-1," https://airandspace.si.edu/, accessed March 4, 2022.

50. Swenson et al., *A History of Project Mercury*, 307–20.

51. Swenson et al., *A History of Project Mercury*, 321–22; and Montoya, email to the author, Subj: "Re: O. J. Ritland," March 8, 2022.

52. NASA, "Transcript of MA-6 Press Conference," February 20, 1962, 7, NASA Archives.

53. Memorandum for the President, Subj: Evaluation of Space Program, April 28, 1961, in John M. Logsdon et al., eds., *Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program Volume I: Organizing for Exploration* (NASA, 1995), 427–29.

54. For more on Kennedy's strategic approach to the Moon race, see David Christopher Arnold, *"We Choose to Go to the Moon": An Analysis of a Cold War Means-Developing Strategy* (NDU Press, January 2022), https://ndupress.ndu.edu/, accessed March 4, 2022.

55. Swenson et al., *A History of Project Mercury*, 335–37.

56. Ritland to Schriever, memo, Subj: "Mercury MA-4 Launch Correspondence," August 23, 1961, AFHRA, K168.8636-20.

57. Swenson et al., *A History of Project Mercury*, 386–89.

58. "Nomination for Exceptional Service Medal," Ritland biography folder, NASA Archives.

59. Ritland oral history, 269–70. This story is consistent with a Ritland family story in which Ritland asked Glenn, "Are you sure, John?" Glenn asked back, "Would you [get in], general?" to which Ritland responded "YES!!" Glenn then said, "If it's good enough for you, it's good for me." (Susan Ritland Kosich, "Ritland Oral History questions" for the author, postmarked November 2, 2021.)

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64. Montoya, email to author, "Fwd: Grandpa Stories," June 29, 2022.

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66. Young with Hansen, *Forever Young*, 79–80.

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edition of the journal. See also O. J. Ritland, "General Ritland Directs AF Space Effort: Coordinates with NASA," *Data* 9 (January 1964), 27–31.

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83. "MSFEB Charter," 1–2.

84. "Minutes of Meetings," NARA, RG 255, Records of NASA, "Manned Space Flight Experiments Board Minutes." The meetings cited here are 64-2 (March 25, 1964), 64-3 (May 13, 1964), 64-5 (September 21, 1964), 64-6 (November 16, 1964), and 65-5 (September 20, 1965). Board 65-5 was Ritland's last meeting. Brig Gen Harry L. Evans replaced him on the board when Ritland retired in December 1965.

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113. “The Story of the Manned Orbiting Laboratory,” part one.
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115. Spires, *Beyond Horizons*, 129.
116. Pealer, “MOL Part I,” 6.
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122. John G. Norris, “AF Orbital Lab Seen as Birth of ‘Space Force’,” *Washington Post* (December 12, 1963), A2.
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128. Howard Simons and Chalmers M. Roberts, “Role in Arms Control Clinched MOL Victory,” *Washington Post* (September 5, 1965), A1; and Roy F. Houchin II, “Interagency Rivalry? NASA, The Air Force and MOL,” *Quest: The History of Spaceflight Quarterly* 4, no. 4 (1997): 38.
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131. “So Vast, So Beautiful, So Overpowering," 30-39.
132. Foulois, *From the Wright Brothers to the Astronauts*, 292–93.

133. Col Albert Crews, USAF (Ret.), "Meet the Astronauts of the Manned Orbiting Laboratory," National Reconnaissance Office (May 14, 2021), https://www.youtube.com/, accessed December 20, 2022, about 35:30.

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135. Pealer, "MOL Part I," 11.

136. Ritland oral history, 280–82.

137. John Uri, "50 Years Ago: NASA Benefits from Manned Orbiting Laboratory Cancellation," NASA History (June 10, 2019), https://www.nasa.gov/, accessed July 28, 2022. For more on Lawrence, see Homer, *Spies in Space*, 40–41.

138. Quoted in Homer, *Spies in Space*, 30.

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146. Berger, "History of the Manned Orbiting Laboratory Program," 77–78.

147. Berger, "History of the Manned Orbiting Laboratory Program," 22.

148. Berger, "History of the Manned Orbiting Laboratory Program," 23.

149. Berger, "History of the Manned Orbiting Laboratory Program," 23.

150. Berger, "History of the Manned Orbiting Laboratory Program," 22.

151. Spires, *Beyond Horizons*, 132.

152. Spires, *Beyond Horizons*, 133.

153. Spires, *Beyond Horizons*, 132–33.

154. Spires, *Beyond Horizons*, 132.

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156. Spires, *Beyond Horizons*, 131.

157. Gruen, "Manned versus Unmanned Space Systems," 75.

158. Melvin Kranzberg, "Technology and History."

159. Ritland oral history, 251.

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161. Michael H. Gorn, *Harnessing the Genie: Science and Technology Forecasting for the Air Force, 1944–1986* (Office of Air Force History, 1988), 88–102.

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163. Presentation, probably to the Secretary of the Air Force, O.J. Ritland, "Project Forecast Status Report" (September 23, 1963), digital recording, provided to the author by Kathleen Ritland Montoya. Schriever introduced Ritland's presentation.

164. Ritland oral history, 245–46.

165. "Director's Summary Report Project Forecast" (February 12, 1964), 13, Stever Papers; and Gorn, 112.

166. Ritland oral history, 251.

167. Gorn, *Harnessing the Genie*, 105.

168. Gorn, *Harnessing the Genie*, 106. Underlined in the original.

169. James W. Canan, "Shortcuts to the Future," *Air Force* (October 1987), 70–76, https://www.airandspaceforces.com/.

170. Gorn, *Harnessing the Genie*, v; and James W. Canan, "USAF in the Twenty-first Century," *Air Force* (August 1, 1986), https://airandspaceforces.com/, accessed January 12, 2023.

171. Ritland oral history, 371–72.

CONCLUSION

FLYING HOME

On December 1, 1965, Maj Gen Osmond J. Ritland retired from the United States Air Force.

The previous few years had been rough on Ritland, General Schriever said at the retirement dinner, because Ritland was "always a man of action" and things move slower in Washington than in other places. Schriever made a point of saying that "Ossie is one of the few people that has more friends than enemies in DC." In a sign of just how many friends Ritland had in government, NASA awarded him its Exceptional Service Medal for his contributions to the Mercury and Gemini space flight programs.[1] And fellow pilot and Distinguished Flying Cross awardee Senator Howard Cannon (D, Nevada) entered Ritland's biography into the Congressional Record, praising Ritland as "one of this Nation's outstanding military leaders."[2] To honor his retirement, the Air Force awarded Ritland its first Distinguished Service Medal.

Ritland then served as vice president for launch for the McDonnell Douglas Corporation for five years. In 1972 he moved to Lockheed Missiles and Space Company, "where he worked as a special assistant in the space systems division until his retirement in 1973."[3]

When asked to wrap up his thoughts on his career, Ritland was characteristically modest.

> The only thing I can say is that my career has been exceedingly interesting, and I have never regretted one moment of any assignment. I've never had a bad assignment in my life. Progressively, each one of my assignments led to a more important, progressive assignment of importance to me and to my family and to the country. The only thing I can say is that I would still like to be contributing, but I guess you have to stop sometime in your contribution or active service in the military. But I'd just as soon start all over again as a second lieutenant and have at it, get in the airplane, and go to town. But I'm grateful

> to the Air Force because of what they did for me, allowed me to be where I am today. I think it's pretty great.[4]

In his Pulitzer Prize–winning book *...the Heavens and the Earth: A Political History of the Space Age*, historian Walter McDougall argued that federal mobilization of technology and brain power during the early Cold War resulted in "technocracy," defined as "the management of society by technical experts."[5] Government support of research and development with political control is another way of thinking of technocracy, which McDougall argues took over the United States when President Dwight Eisenhower presided over a vast expansion of peacetime federal involvement in technology.[6] These elements reached into the space realm during the Eisenhower administration's push to secure accurate intelligence about Soviet systems through programs like the "stopgap" U-2 spy plane and the Corona photoreconnaissance satellite, both of which Ritland was instrumental in seeing to success. But, asserts McDougall, technocrats took over the space program, starting with the need to establish the legal right to use space capabilities to spy on another nation, the so-called overflight dilemma.[7] This legal regime for space, which differed from the established legal regimes for the air or sea, eventually established and preserved the United States' need for information and openness. To be sure, people did take ideas from the space programs to apply them to the greater American society. Schriever himself started a company called Urban Systems Associates to solve problems of urbanization, and his company Schriever Associates was intended as a "consortium of systems-oriented business concerns to help solve urban problems."[8] Ritland, on the other hand, took his experience and skills with him to Douglas Aircraft when he retired but with the intent to help with the Manned Orbiting Laboratory program, not the intent to change the world through technocracy.

Michael Roberts and Geoffrey Parker, who both wrote about revolutions in military affairs, have pointed out that the requirements for a revolution to occur (or to have occurred) range from technological and organizational changes to social, doctrinal, and political-economic changes.[9] What the United States and its allies did during World War II and in the early stages of the Cold War fundamentally revolutionized military affairs. Ritland was a key participant in standing up the ICBM fields and the constellations of satellites the United States used to deter the Soviet Union, systems that were far less expensive and smaller than the legions of soldiers in previous eras of warfare. The Soviet response included their own ICBM fields and satellite constellations. Ritland acknowledged as much when he suggested to the 1962 gathering of cadets that four revolutionary technological developments had occurred just in their lifetimes, including the advent of jet aircraft, nuclear weapons, ballistic missiles, and space systems.[10]

In his official US Air Force interview with Lt Col Lyn R. Officer, Ritland answered a question about whether technical competency or management ability is more important. Ritland argued it is

> a combination of both. I know of many, many technical people, scientists who are extremely competent and capable in their technical way, but who have absolutely no interest in management. To me management is people; but they have no interest in people or managing. All they want to do is look at the end product. So that isn't the kind of guy you want running an organization. On the other hand, you don't want someone who is simply a manager that is managing people and looking at the ledger and the dollar value without knowing what he is building. So to me it has to be a combination of both.
>
> I think the combination of both has to be gained through experience, time, coming up the ladder, and being assigned a task as a young officer or a young engineer and given the responsibility to produce this on schedule within cost and to meet the specifications that it was designed for. But then if you get in there and try to tell him [the young officer] how to run it, you're messing up your whole ground rules. People will grow in time, and they will have more and more responsibilities and then become, you might say, essentially a technical expert. In my experience, I learned so much flying airplanes in the test organization at Wright Field that when I finally took over the aircraft laboratory, which I guess is the avionics laboratory today, I was able to understand technical terms, technical equations that I hadn't been familiar with—I'm talking about dynamics, aerodynamics, structural approaches—just through experience gained in this practical approach.

Ritland was successful as a military leader because he was both technically competent and a good leader. When the airmail crisis hit the US Army, Ritland had to fly airplanes he had never flown before. When that crisis ended, his transfer to the airlines took him down a different path than fighter pilot, leading him to help incorporate the revolutionary Boeing 247D into United's fleet. In netting 3,000 flight hours, he got so good the company assigned him as leader of its Link training simulator system. As a test pilot, he literally flew hundreds of airplanes to determine their worthiness for the war effort. As commander of the only Air Force test group dropping bombs on the United States, Ritland's confident nonchalance hid a professionalism essential for such a critical and dangerous mission. As leader of the U-2, Corona, and ICBM programs, Ritland used his technical competence to solve problems and lead the next revolutions in national defense.

That technical competence did not come at the expense of leadership. Good leaders successfully lead troops at an overseas location when there is no mission, and the sole focus of the troops is on going home. Good leaders show up to an aircraft maintenance hangar in the middle of the night to check on repairs to a single airplane and then stay to shoot the breeze until late into the night. Good leaders are recognized by multiple agencies for the work they do to accomplish the mission because the people who make up these organizations know the leader recognizes their value as much as the mission that needs to get done.

And good leaders are humble. When Ritland was home, he loved to do yard work. "He was all about maintenance and perfection," recalled daughter Susan Ritland Kosich. One day, at his quarters on Andrews AFB, some curious interlopers drove up while he was working in the yard. The following interchange took place, and according to Susan, the family laughed about it for years.

"Hi, can you tell us who lives here?" came the question from the car.

Ritland's response: "Sure, this is General Ritland's quarters."

"Wow, do you keep it up for him?"

"Yes, I do."

"Well, you do a nice job. Is he a nice guy?"

"Thank you," Ritland replied. "And yes, I think he is!"[11]

In an interview with a local newspaper in 1990, Ritland credited Martha with “creating a happy home life for himself and their two daughters” while he was in the military. “My career was pretty stressful because I was always under the gun to get something done, and that wasn’t always easy on us. . . . For example, when I was commander of the Air Force ballistic missile division, I was away from home for 262 days out of the year. But I did what I had to do.”[12] On the occasion of her husband’s posthumous induction as a National Reconnaissance Office Pioneer, Martha said, “Ossie was a kind and loving husband and father but his family understood that his job had to come first in those tense years. That priority continued throughout his Air Force career, and my daughters and I are proud and thankful for all he did for his country and for us.”[13]

The Ritlands retired to Rancho Santa Fe, California, in the hills north of San Diego, where in 1974 they had built a house about 30 miles from where they went to high school. For most of the next two decades they spent time with their grandchildren and he played golf. He told a reporter in 1990, “I was in the Air Force at the best time because it was the start of the development of planes, ballistic missiles, and space. . . . I don’t think it would be as much fun now.”[14]

Osmond Ritland passed away on March 23, 1991, at a hospital in Encinitas, California, at age 81, survived by Martha, two daughters, and five grandchildren. The family held a memorial service at the Miramar Naval Air Station chapel.[15] Martha died in 2008. They are buried in a simple military grave in Fort Rosecrans National Cemetery, overlooking the Pacific Ocean.

When Ritland’s career began flying single-engine, open-cockpit, wooden airplanes, the US Army Air Corps was woefully behind most national air forces in size and technology. The air force he served in during World War II became the largest in history. While he flew for United Air Lines in the late 1930s, the American commercial aviation landscape changed from slow tri-motor airplanes taking off from grass airstrips to fast, low-wing, twin-engine, flying luxury liners landing on concrete runways at full-fledged airports. During World War II, he risked his life nearly every day flying experimental airplanes. By the time his career ended, he had worked on aviation and space programs that inspired millions and protected billions from World War III. His leadership of people surpasses even his leadership of programs as his defining legacy, ensuring a positive, lasting impact on people while engineering revolutionary ideas in air and space power.

Notes

1. “The Ritland Fan Club,” retirement dinner, on or about December 1, 1965, trk 8, 6:50–13:00.

2. “Retirement of Gen. Osmond J. Ritland,” *Congressional Record*, January 24, 1966, 1004–5.

3. Lorine Flemons Wright, “Major General Blazes Path in Air Force History,” *Rancho Santa Fe Review* (October 24, 1990), 23, provided by daughter Kathleen Ritland Montoya.

4. Ritland oral history, 370–71.

5. McDougall, 5–8.

6. McDougall, 225.

7. McDougall, 109–13.

8. Robert B. Semple Jr., “Schriever to Aid Fight on Slums,” *The New York Times* (February 26, 1968), 25.

9. Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500–1800* (Cambridge University Press, 1988, 1996).

10. Ritland, “Keynote Address.”

11. Martha Susan Ritland Kosich, “Ritland Oral History questions” for the author, postmarked November 2, 2021.

12. Wright, “Major General Blazes Path.”

13. Martha Ritland, quoted in McDonald, *Beyond Expectations*, 306.

14. Wright, “Major General Blazes Path.”

15. “Osmond J. Ritland; Leader in Air Force,” *The Los Angeles Times* (March 28, 1991), OCA28.

APPENDIX

List of Airplanes Ritland Flew

The Edwards Air Force Base History Office has two tabulations of the aircraft Ritland flew. The date of the first table is February 29, 1952. The date of the second is unknown but, in his handwriting, says it was sourced using the Individual Flight Record (Army Form 5) in his personal records. His November 1961 HQ Space Systems Division biography states that by then he had over 9,400 flying hours, the equivalent of over a year at the controls of an airplane.

Total types listed: 229

Total types and models listed: 345

Type of aircraft and number of hours flown is as of February 29, 1952.

Type	*Hours*
A-3/A-3A	Unknown
A-17/A-17A	73
A-18	18
A-20A, C, B, G	62
A-24	2
A-26A	8
A-29	1
A-31	1
A-36A	6
AT-6, A, B, C	112
AT-7	12

Type	*Hours*
AT-8	4
AT-9	30
AT-10	46
AT-11	3
AT-12	3
AT-16	7
AT-18, A	8
AT-23, A	6
AT-33, A	2
B-10, B	1
B-17, B, C, D, G, E, F	254

Type	Hours
RB-17, E	86
B-18, A, AM, M	205
B-23	27
B-24, D, C, J	28
B-25, A, B, C, H	507
B-26, A, B, C	107
RB-26, B, C	5
B-29	39
B-32	3
B-34	1
B-36	2
B-45	32
B-47	1
B-50	86
C-24	1
C-33	6
C-38	12
C-39	10
C-40, A, B	12
C-43	1
C-45	58
UC-45B	2
C-46, A	16
C-47, A	512

Type	Hours
C-53	10
C-54, A, B	47
C-55	35
C-60, A	6
C-61	2
C-69	50
C-76	3
C-86	1
C-87, B	1
C-93	1
UC-67	20
UC-78	28
F-2	3
F2A3	4
F4F3	1
F6F3	1
F4U1	4
FW190	1
F13	6
F-80	8
F-82	1
F-84	4
OA-9	22
O-19-B	48

Type	*Hours*
O-25-C	11
O-38, B, E	13
O-46, A	11
O-47, A, B, Water	36
O-49	14
O-52	1
O-59, A	1
F-12, B, D, E, F	226
P-26, A, B	180
P-35, A	10
P-36, A, B, C	37
P-37	1
P-38, D, G, J	13
P-39, C, D, F, Q	20
P-40, B, C, E, F, N	132
P-42	1
P-43, A	3
P-47, B, C	10
P-51, B, D	26
P-59A	1
P-63A	1
P-64	6
PQ-8	1
BC-1	1

Type	*Hours*
BC-2	3
BC-3	2
BT-2, A, B, C BT-2 BR, FBT-2	2 91
BT-8	3
BT-9, B, C, D	24
BT-13, A	45
BT-14	26
BT-15	4
BT-160K	1
BTC-1	1
B-10BM, B-10B	1
BM-10	1
PT-3, A	27
PT-13, A, B	3
PT-17	3
PT-18	3
PT-19	11
PT-20	2
PT-21	6
PT-22	10
PT-27	2
PTLM-4	1
PT-26	2
PB-2, A	4

Type	*Hours*
YB-12, A	1
YB-40	1
YFM-1, A, B	5
YO-51	2
YO-55	1
YP-37	4
YP-38	2
YP-39	38
YP-59, A	1
YP-61	1
YPT-14	2
YPT-15	3
YR4B	20
XA-21	5
XA-32, A	1
XA-41	1
XA-19, B	4
XA-22	8
XAT-14	3
XAT-13	2
XAT-15	13
XAT-16, XB-15	1
XB-18/21, A	12
XB-24K	3

Type	*Hours*
XB-26F	21
XB-28	2
XB-32	22
XB-42	1
XC-35	1
XBT-12	13
XL-6	1
XP-37	4
XP-38, A	11
XP-39	1
XP-40, Q	10
XP-46	6
XP-47F	1
XP-51, F, B	19
XP-55	1
XP-59, A	2
XP-60, E, C	3
XP-67	2
XP-77	1
XP-80	1
XPT-14	1
XPT-23	2
L-1AP, L-1A	2
L-2B	2

Type	*Hours*
L-3, C	1
L-5	5
T4-106	26
CQ-1	5
ME109E	2
WT-1	1
K9370	1
NC-41172	1
7-W	1
W3119	2
LB-30	7
Ventura	6
Spartan	4
Vega	6
Wellington	1
Stinson	1
Zero	1
Lancaster	1
Anson	4
Defiant	7
Rearwin	1
Moth	1
Erco	1
Hurricane	10

Type	*Hours*
Spitfire	3
Mosquito	7
R5D	1
ZC-8, A	1
N9M	1
YH-19	1
SB2C1	3
SB2U2	1
JU88	1

Data compiled from Ritland papers by Christopher D. Arnold

ACKNOWLEDGMENTS

In 2003 when I was a student at Air Command and Staff College, I suggested and hosted retired Lt Gen Forrest McCartney as a member of the program called "Gathering of Eagles," in which we invited people we hoped would be good examples to the next group of Airmen who would lead the Air Force of the future. Part of that program was a biographical paper we had to write about the eagle we hosted. My paper eventually became an article in *Air Power History* called "Lt. Gen. Forrest S. McCartney: The First Space Professional."[1] My thanks to Dr. Rich Mueller for choosing me for that team and for his encouragement ever since. I edited the volume that became the program and accompaniment to a painting we commissioned by aviation artist Jay Ashurst, for whom I was the team's intermediary. From there I was introduced to others of Ashurst's works, including one I purchased and framed depicting the first class of the military's space and missile pioneers, a "group of visionaries who played key roles in establishing the foundation of our nation's military space power," according to its website.[2] Among the dozen faces was Maj Gen Osmond J. Ritland, USAF, whose portrait was not personally signed because as it said on the picture, "pioneer is deceased." Truth be told, General Ritland has been staring at me since then.

When I was doing my dissertation research in 2000 and 2001, I had a chance to talk to many of the men whose names are in that hall of fame today, including Bernard Schriever, Forrest McCartney, Bill King, and Tom Haig. The result of that dissertation project, of course, was my PhD and a subsequent reworked book called *Spying from Space*.[3] Ritland appears in that book more than a half-dozen times but generally in a supporting rather than leadership role, even though his place in the pantheon of American military space leaders indicates he was no bit player. Although that book is a biography, if you will, of a large technological system and there is some overlap with this biography, I promise you not a lot of the story overlaps. Ritland joined General Schriever in Los Angeles in 1956, succeeded Schriever in 1959, and then moved to join Schriever in DC in 1962, until Ritland retired in 1965. But Ritland's career began as military pilot in the 1930s and included much more than space systems development.

Another connection to this biography is another book that I had been thinking about for many years that I wanted to write, now called *Space Force Pioneers: Trailblazers of the Sixth Branch*. That book was inspired both by Edgar Puryear's *Stars in Flight*, in which he gives us biographical chapters of Henry Arnold, Carl Spaatz, Hoyt Vandenberg, Nathan Twining, and Thomas White, and John L. Frisbee's edited volume *Makers of the United States Air Force*, in which he gives us 12 biographical chapters of American aviators who had an enormous impact on the US Air Force. I assembled a team of terrific historians for *Space Force Pioneers* who produced some wonderful chapters about people who were influential in the creation of the United States Space Force (USSF). A much shorter version of the biography you are reading now of Ritland's impact on the space business appears in *Space Force Pioneers*.[4]

Finally, no project like this happens with just the author writing away at a desk but with the support of many, many people, even if any errors lie with the author alone. I need to acknowledge the Ritland Family, especially daughters Kathleen Ritland Montoya and Martha Susan Ritland Kosich. My National War College colleagues, especially Mark Bucknam, Colton Campbell, Furman Daniel, Todd Glasser, Mark Mattox, Adam Oler, Robert Orr, Mike Peznola, Kelly Ward, Cynthia Watson, and Bob Watts, read much of this project and gave it tremendous support. Air University's Thomas A. Hughes and Temple University's Jay Lockenour were a great help in the craft of biography. Air University Press's Donna Budjenska was a huge help, but all the remaining errors are mine alone.

I am indebted to the legions of unit historians and oral historians who only knew at the time that they were trying to preserve history for future generations. Many, many archivists helped, including San Diego State University Special Collections' Jessica Brubaker, Amanda Lanthorne, and Adam Burkhart; NASA HQ Archives' Sarah Jenkins and Sarah LeClaire and NASA historian Stephen Garber; Oregon Historical Society Research Library's Scott Daniels; Society for Experimental Test Pilots' Tammy McDonald; Air Force Historical Research Agency's Maranda Gilmore, Tammy Horton, and Patrick

Charles; Oral History Archives at Columbia University's Chelsea Reil; Eisenhower Library's Michelle Kopfer; and USAF Academy Special Collections' Joel Hebert. Air Force Materiel Command History & Heritage Directorate, Ronald Ortensie, and 412th Aerospace Test Wing History Office historians Stephanie Smith and James Tucker opened their archives and their workspaces to me. National Defense University Special Collections' Susan Lemke and Abigail Gardner helped fill in the details on Ritland in school, and NDU Interlibrary Loan, especially Kimberley Jordan, found me everything I asked for. Several museum folks helped, including March Field Museum's Sterling Jenson; Grossmont High School Museum's Connie Baer and Lynn Baer; San Diego Air and Space Museum Library and Archives' Melissa Culbertson and Debbie Seracini; National Museum of the United States Air Force's William McLaughlin; Seattle Museum of Flight's Steve Ellis and Chris Stanton. I also need to thank USAF Public Affairs' TSgt Ashley Taylor; the Henry H. Arnold Family's Robert Arnold; Lee-Volker Cox; and United States Space Force Space Systems Command historian Robert Mulcahy. I especially want to thank United States Space Force Space Training and Readiness Command historian Rick Sturdevant, who has been a mentor for a long time. And no list of thanks would be complete without my wonderful and patient wife, who listened to many stories about General Ritland and smiled through them all.

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Kathleen Ritland Montoya
Patrick J. Charles
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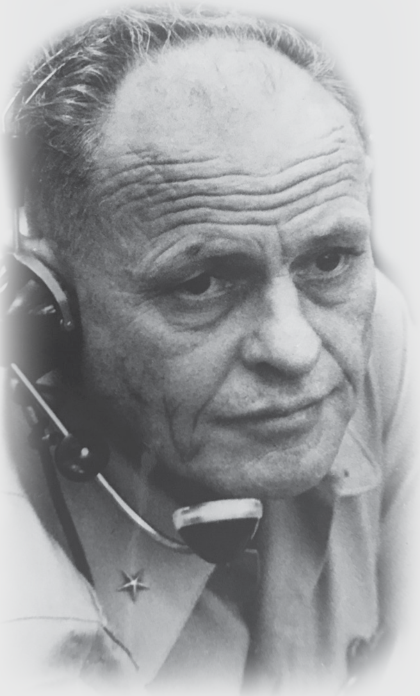

Osmond Ritland participated in some of the most important changes taking place in the jet age, the nuclear age, the missile age, and the space age. Ritland was deeply involved in revolutions that took place in the jet engine, in commercial aviation, and in space technologies. Aviators, in Ritland's words, went "from the Jenny to the jet, from Kitty Hawk to Canaveral, and into space itself." This book is simultaneously a biography of an American space pioneer and a look at the dramatic evolution of American aviation through the life and career of a particular individual who served as a test pilot in the US military during World War II and the Cold War, flew in civilian commercial aviation, and led both manned and unmanned military space programs.

In this engaging biography of Maj Gen Osmond Ritland, historian David Arnold has extracted an astounding amount of valuable information from sometimes obscure sources to weave a narrative full of interpretive insights. Through Arnold's telling of the story, we come to understand Ritland as a characteristically modest man, a master of both technical competency and leadership ability, who met the engineering challenges of "radical design" from jet aircraft and spy planes to reconnaissance satellites and human spaceflight.

—Rick W. Sturdevant,
director of history, Space Training and Readiness Command, United States Space Force

This biography is long overdue and extremely timely. David Arnold, space operator and space historian, has given us an important look at how technical skills coupled with strong leadership can create revolutionary change. General Ritland—whose career stretched from flying open-cockpit wooden airplanes to overseeing Air Force and NASA space programs—is an example not just for the US Space Force but for every leader.

—Lt Gen John Shaw,
United States Space Force (Retired)

ISBN 9781585663378
AIR UNIVERSITY PRESS
9 781585 663378