**Appendix G:**

# The U-2 and the CIA

Early in 1955, by presidential order, sixty square miles of this prohibited area were set aside for a special purpose. There's a narrow air corridor to reach this spot on the map. Air charts ordered closed to all personnel and aircraft, except on orders from the Chief of Staff, US Air Force.

The name of this isolated spot in Nevada is Watertown, and its very isolation is of the greatest importance. The specialists that come off this transport are hand-picked. They are checked every time they arrive at Watertown. Overall security in this area is the highest yet to be maintained in this country, even higher than that of the Manhattan Project.

Selection of Watertown was dictated by several unique considerations. The area is isolated from prying eyes by the AEC range with lethal reminders of past atomic explosions. AEC guards maintain regular patrols. Supplies destined for Watertown channel into the area through regular AEC routes.

In Watertown radio and teletype communications, the Angel is referred to as an "article." Her pilots are called drivers. The geographical spot of Groom Lake is called "homeplate." The Angel was designed to do a single job: obtain the largest amount of reconnaissance information ever collected on any single flight.

For the first time in jet history, it is possible to inspect 400 square miles with a single cartographic photograph. For the first time in jet history, sensitive electronic equipment is being carried to heights where it can search for any number of radio, TV or radar signals and record this information for detailed analysis.

There are already twelve alternate equipment loads for the U-2. Development of the Angel and the information gathering equipment that it carries is the result of the most experienced judgment applied at every critical point.

A select group of capable, dedicated men in industry and government, working with trust and cooperation, completed this specific project at the utmost speed. The idea for the Angel itself was born when Lockheed started a design study on the maximum altitude possible from a jet airframe for reconnaissance purposes.

The Angel, then called the CL 2-82, took sufficient form to be presented as a proposal. Members of the Killian Committee, a portion of the Scientific Advisory Group, defined the technical feasibility and urgency of the program. The optical and photographic concepts were envisioned by Dr. James Baker and Dr. Edwin H. Land. The original CL-282 proposal was then modified to produce even more spectacular results. On December 9th, 1954 the go-ahead was given, and Lockheed's Chief Engineer Kelly Johnson called together his tiny 26-man special projects engineering group.

Here were the problems they faced: to design, build an airplane and fly it in eight months. An airplane that would cruise well above 70,000 feet. One that would travel almost as far as a B-52 and remain in the air for ten hours.

A plane that would be completely reliable with forced landings out of the question and the world's most stable aircraft for high-altitude photography. A plane that would be flexible in concept to carry at least twelve different equipment loads and have no one penalize the others in weight. A plane that would weigh only one and one half times the weight of the power plant.

Weight was the critical factor in the whole project. Designers said they would trade their collective grandmothers for 10 pounds of empty weight. Pounds in fact were called grandmothers. But weight could not be saved at the expense of reliability.

A real engineering challenge met with proven know-how and a basic design so simple that it was almost revolutionary. The Angel is simplicity itself. All control surfaces are cable operated. The tail section of the fuselage attaches with only three bolts. The inside of the 80-foot wing is just four big fuel tanks The interior of the fuselage is plain and uncluttered. The cockpit canopy stressed to handle a pressure differential of five pounds per square inch is operated by hand. The pant leg engine intake ducts presented a problem.

At altitude near-perfect ram-air distribution was needed to keep the engine running. The final intake on the Angel gives as good pressure distribution as would be found in a power plant wind tunnel. A unique gust-relieving feature was designed into the wing of the Angel to reduce tail loads and wing bending in turbulence. The flaps tilt four degrees upward and the ailerons tilt ten degrees to completely change the airfoil characteristics.

During development of the Angel, Kelly Johnson met with each member of the special projects group at seven every morning. Any problems occurring on the previous day were discussed and corrective decisions were made immediately.

Subcontracting was virtually impossible. Eighty-seven percent of the prototype Angel was fabricated in one building in Burbank. Components were run through the company's big presses at night and on Sundays... then hidden from dayshift workers.

The CMJ Manufacturing company for Clarence Johnson was formed in an unmarked downtown warehouse to handle shipments from vendors in unmarked trucks. Designers of the Angel couldn't even get into a high-speed wind tunnel, so calculations were made with computers. Fifty percent of production took place in this building at Bakersfield. At peak production of the 50 U-2s, only 600 people were involved. Just one man in every 60 on the Lockheed payroll. The Angels were completely assembled here, checked out, disassembled and shrouded in canvas for airlift to Watertown

Fuel and hydraulic fluid were added for the first time that Watertown and the Angels were tested by company pilots. Because of its long, thin wings, the Angel has been referred to as a jet glider. It has the world's most efficient lift- drag ratio for powered aircraft: 25.6 to one. That's better than many competition sail planes.

From 70,000 feet, the Angel can glide 300 miles without power. The engine for this aircraft was originally the Pratt and Whitney J57-37. A 10,500-pound thrust unit built for the B-52. A later 11,500-pound version, known as the -31, was developed specifically for the Angel. Pratt and Whitney President Jack Horner and Chief Engineer Wright Parkins crammed a normal three-year engine development program into 12 months. The new engine has a 16-stage compressor with 9 stages in the low range and 7 in the high pressure chamber.

The low-range compressor is driven by a hollow shaft and turns at a lower speed than the high compressors. The Pratt and Whitney engine operates at full power for the duration of the flight. At sea level this unit gulps nearly 9,000 pounds of fuel oil per hour.

At 70,000 feet this drops to 700 pounds per hour. At 74,600 feet, the engine will quit from oxygen starvation. In early stages of the program as many as six flameouts occurred on a single flight. With the new fuel system and turbine design of the -31 engine, flameouts have ceased to be a critical problem.

An improved ignitions system ensures air restarts at high altitudes. In the first 20 months that the Angel flew, logging over 5,000 hours in the air, there were just two forced landings away from Watertown.

Both planes, equipped with the older -37 engines, landed at Kirkland Air Force Base Albuquerque, New Mexico. After each development flight, a careful accounting is made of fuel consumption. A special fuel, dubbed lighter fluid, was developed by Shell Oil Company specifically for the Angel, and the finished product was shipped to Nevada in tank cars labeled LF 1A. This blend will not boil at the low pressures encountered at altitude, yet will still give adequate air starts. It is so volatile that fire seldom follows a mishap.

A simple 100 gallon-slipper tank has been developed to fit each wing for extremely long flights. These pressurized tanks contain enough fuel to carry the Angel to cruising altitude where they have no significant effect on speed or range. Even after the addition of an external drag chute, three times the normal oxygen supply, improved breaking and an autopilot, the final all-up weight was within ten pounds of the original proposal.

The Angel exceeded original performance limits in both ceiling and range. When the prototype Angel was flown across Death Valley to Watertown, Lockheed also found itself in the transportation business. Their own DC3 made almost daily flights to Watertown with a hand-picked crew of flight line mechanics.

The first unofficial name for Watertown was Paradise Ranch. This description was dreamed up tongue-in-cheek to encourage key personnel to accept assignment on this special project before they could be told what it involved.1 Anyone for golf?

Many newcomers guessed that the project involved an atomic powered aircraft and were astonished to find that they were to work with [missing audio]. Two days later, in a rainstorm, the Angel went to 8,000 feet. That day it took five attempts to land the plane because it would fly on idle engine thrust. The unusual bicycle landing gear, designed for the lightest possible structure, weighs 257 pounds. The conventional gear on a comparable aircraft would weigh 750 pounds and take room out of the wings that is vital for fuel. Wing mounted pogos drop off during takeoff; again in the interest of saving weight.

Weight, and space, that paid off in an extra 1,500 feet of altitude and 100 miles in cruising radius. As the operation at Watertown grew in scope, more transportation was required. A daily military air transport shuttle system was begun with C-54s from Burbank.

In bad weather, one of these transports crashed into Charleston Peak a few miles north of Las Vegas. Fourteen members of the Watertown project were aboard. The program has not been without other casualties. One Angel crashed at Watertown.

Another disintegrated over an Indian village named Wide Ruin in Arizona. 9A third with Lockheed pilot Robert Seeker aboard disappeared near Watertown. By the time this plane was found some information about the project at Watertown reached the public. This nearly three years after its conception.

That dust cloud is an actual crash. Rescue crews rushed to the end of the runway where an Angel has landed short. The pilot here was uninjured. But emergency crews take no chances with leaking fuel. Salvage operations mean that this fallen Angel will soon fly again to rejoin its sister ships already in the air.

This project has had fewer mishaps than is normal with new aircraft. Yet unique ground handling equipment, designed solely for the Angel, operates as well at this crash scene as it does on the flight line. Not all the difficulties at Watertown have come from the Angel herself. Extremes in weather, wind, sand and heat – snow - cloud burst - biting cold - an ever-present headache. But the Angels must be ready for tomorrow's flight.

It's almost all work and no play for the temporary desert dwellers at Watertown. Just 72 airline miles distant is Las Vegas. However, none of Watertown's workers can visit these bright lights or refreshing scenery. Security is just that rigid. Meanwhile, back at the ranch, volleyball, pool and a 16-millimeter movie in a tiny converted mess hall are just about the only diversions. Those who remain over a weekend may explore long deserted goldmines. Remnants, from another era of rugged desert pioneers.

Here as seen by few men is what the world looks like from 70,000 feet. These scenes were photographed over Arizona by Ray Goudy, one of the five Lockheed test pilots who have handled all development and production testing of the Angel.

Training of new pilots begins with the T-33 for familiarization flights. The pilot must be able to hold the T- bird inches in the air for the length of the lake, so that he will be able to hold the Angel at the same altitude until its broad wings lose all their lift. This mastered, he graduates to the Angel and transition landings on the dry lake. A chase car and chase plane both with two-way radio are used during this phase of training. Seat belts in the chase car are good insurance.

The new Angel pilot makes at least three landings with the pogos installed. She's a little easier to handle that way. Takeoffs are smooth from Groom Lake. A wide circle as the chase plane plays follow the leader. "Now turn in on final approach," says the instructor in the chase plane. Your air speed is 92 knots. The chase car pulls into line and picks up speed. He's leveling off, just a little high. And at 72

knots here comes the stall. The best way to land the Angel is in a full stall, just like the old fashioned airplanes with tail wheels. The broad, dry lake at Watertown makes an ideal location for this type of transition training.

After the landings improve, the pogo safety pins are removed and the new pilot is on his own. Sometimes the drivers taxi right up to the hangar doors. Not bad at all for an airplane that's supposed to be hard to handle on the ground. After a number of day flights, the new Angel pilots are ready for night transition and long cross country flight.

It's no accident that the complete Angel and all its intricate cargo can be disassembled and packed quickly, ready for airborne transport. Everything about the Angel can go aboard a cargo plane. Cameras in their dog houses, engines, lab equipment and supplies, ground support equipment and of course the Angel.

The result of foresight and planning, engineering, precise and rapid manufacturing. That's it. What it is and what it can do. A vital chapter in modern American achievement. From the desert wastelands of Watertown, it's but a matter of hours to anywhere in the world where reconnaissance might be desired.

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# U-2 Overflights and the Capture of Francis Gary Powers, 1960

On May 1, 1960, the pilot of an American U-2 spy plane was shot down while flying though Soviet airspace. The fallout over the incident resulted in the cancellation of the Paris Summit scheduled to discuss the ongoing situation in divided Germany, the possibility of an arms control or test ban treaty, and the relaxation of tensions between the USSR and the United States.

As early as 1955, officials in both Moscow and Washington had grown concerned about the relative nuclear capabilities of the Soviet Union and the United States. Given the threat that the nuclear arms race posed to national security, leadership in both countries placed a priority on information about the other side’s progress. At a conference in Geneva in 1955, U.S. President Dwight Eisenhower proposed an “open skies” plan, in which each country would be permitted to make overflights of the other to conduct mutual aerial inspections of nuclear facilities and launch

pads. Soviet leader Nikita Khrushchev refused the proposal, continuing the established Soviet policy of rejecting international inspections in any form. Meanwhile, Khrushchev also claimed that the Soviet Union had developed numerous intercontinental ballistic missiles, which only motivated the United States Government to look for new ways to verify developments in the Soviet nuclear program.

The U-2 spy plane program grew out of these concerns. The U-2 was a special high-altitude plane that flew at a ceiling of 70,000 feet. Because it flew at such heights, it was thought it would be possible for the planes to pass over the Soviet Union undetected by radar on the ground. It was important that the overflights be undetected, because normally an unauthorized invasion of another country's airspace was considered an act of war. Operated through the U.S. Central Intelligence Agency (CIA), the first flight over Moscow and Leningrad (St. Petersburg) took place on July 4, 1956. The flights continued intermittently over the next four years. It was later revealed that the Soviets did pick up the flights on radar, and the United States lost a plane over the Soviet Union in 1959, but as long as there was no definitive proof connecting the flights to the United States there was no advantage for the Soviets to raise the issue publicly lest it draw attention to the Soviet inability to shoot down the offending flights.

On May 1, 1960, the situation changed. On the eve of the Paris Summit and during the May Day holiday, CIA pilot Francis Gary Powers took off from a base in Pakistan bound for another base in Norway, with his planned flight path transgressing 2,900 miles of Soviet airspace. Near the city of Sverdlovsk Oblast in the Ural Mountains, Powers encountered Soviet fighter jets, and his plane was shot down. Powers ejected and parachuted safely to the ground, where he was captured by the KGB, and held for interrogation. The plane crashed, but parts of it were recovered and placed on public display in Moscow as evidence of American deceit.

Although the capture of Powers provided the Soviets the concrete proof that the United States had been conducting the flights, it was not immediately clear what the impact would be for the Paris Summit. At first, and before they had confirmation that Powers had survived, U.S. officials claimed that the U-2 had been conducting a routine weather flight but experienced a malfunction of its oxygen delivery system that had caused the pilot to black out and drift over Soviet air space. On May 7, however, Khrushchev revealed that Powers was alive and uninjured, and clearly had not blacked out from oxygen deprivation. Moreover, the Soviets recovered the plane mostly intact, including the aerial camera system. It became instantly apparent that the weather survey story was a cover-up for a spy

program. Khrushchev had publicly committed himself to the idea of "peaceful coexistence" with the United States and the pursuit of détente, so from his perspective, if U.S. President Dwight Eisenhower denied any knowledge of the spy program and the United States apologized, he would have continued the summit. Spying was common, and of course, the Soviet Union had its own agents reporting on developments in the United States. Eisenhower, however, refused to issue a formal apology to the Soviet Union; he had taken a great personal interest in the spy plane program, and considered the violation of Soviet airspace and the reconnaissance of Soviet nuclear facilities serious enough to personally approve each flight. On May 11, Eisenhower finally acknowledged his full awareness of the entire program and of the Powers flight in particular. Moreover, he explained that in the absence of an "open skies" agreement, such spy flights were a necessary element in maintaining national defense, and that he planned to continue them.

Eisenhower's statement left Khrushchev in a difficult position. If he did nothing, that would be tantamount to acknowledging implicitly the right of the United States to spy. But any action Khrushchev did take had the potential to scuttle the upcoming conference and his larger plans for a Soviet-American détente. Ultimately, he demanded that Eisenhower apologize for the past flights and promise to discontinue them as a precondition for entering into the planned negotiations on Germany. Eisenhower's refusal led the Soviet delegation to leave Paris just as the summit was about to begin.

After extensive questioning by the KGB, Powers was convicted of spying and sentenced to three years in prison and seven more of hard labor. In February, 1962, however, he and a detained American student were traded for a captured Soviet spy, Rudolf Abel. Although Eisenhower refused to end the U-2 program, it was quickly overtaken by new technology, as satellite images replaced aerial photographs. For his part, Khrushchev abandoned his attempts to cooperate with Eisenhower, opting instead to wait for the inauguration of the new U.S. President, John F. Kennedy, elected to office in November, 1960.

US Department of State