CIA Spy Plane: Lockheed A-12 Blackbird - Project Oxcart - Project BLACK SHIELD CIA Files, Flight Logs and Manuals

2,347 pages of CIA files. Memos, reports, correspondences and manuals covering the development of the Lockheed A-12 Blackbird, its testing, and its missions, archived on CD-ROM.

The Lockheed A-12 was a reconnaissance aircraft built for the Central Intelligence Agency by Lockheed's famed Skunk Works, based on the designs of Clarence "Kelly" Johnson. The A-12 was produced from 1962 through 1964, and was in operation from 1963 until 1968. The single-seat design, which first flew in April 1962, was the precursor to both the Air Force YF-12 interceptor and the famous SR-71 Blackbird reconnaissance aircraft. The final A-12 mission was flown in May 1968, and the program and aircraft retired in June of that year.

One spring day in 1962 a test pilot named Louis Schalk, employed by the Lockheed Aircraft Corporation, took off from the Nevada desert in an aircraft the like of which had never been seen before. A casual observer would have been startled by the appearance of this vehicle; he would perhaps have noticed especially its extremely long, slim, shape, its two enormous jet engines, its long, sharp, projecting nose, and its swept-back wings which appeared far too short to support the fuselage in flight. He might well have realized that this was a revolutionary airplane; he could not have known that it would be able to fly at three times the speed of sound for more than 3,000 miles without refueling, or that toward the end of its flight, when fuel began to run low, it could cruise at over 90,000 feet.

As preliminary work began inside Lockheed in the late 1950s, to develop the successor to the U-2, the designs were nicknamed "Archangel", after the U-2 program, which had been known as "Angel". As the aircraft designs evolved and configuration changes occurred, the internal Lockheed designation changed from Archangel-1 to Archangel-2, and so on. These nicknames for the evolving designs soon simply became known as "A-1", "A-2", etc. The A-12 was Lockheed's 12th design in this development of the U-2 successor. However, many documents, and references to individual craft, use Clarence Johnson's preferred name for the plane, "the Article".

DOCUMENTS ON THE CD-ROM

CIA A-12 FILES

437 pages of CIA files composed of reports, correspondences, memoranda, reports and background studies concerning the A-12. Files date from 1959 to 1991. Highlights from the files include: A 1959 memo

details the organization and delineation of responsibilities of Project Oxcart. A 1962 report details the measures for keeping Project Oxcart secret and pre-planned cover stories for various contingencies that might expose the project. A 1962 memorandum of conversation between Director of Central Intelligence John McCone and Secretary of Defense Robert McNamara, mention is made of President John Kennedy's position on flying manned aircraft over the Soviet Union. A 1963 report covers how wide and where knowledge of the existence of the Oxcart has spread. Accident reports concerning crashes Of A-12 Oxcarts. Accounts of briefings made to President Johnson on the development of the Oxcart A-12. A report on efforts to get the YF-12A prepared to break speed records as promised by President Johnson. A 1966 special national intelligence estimate, covers the possible reaction by China if the Oxcart flies over its territory. Summaries of Black Shield missions in which the Lockheed Oxcart A-12 flew over China, North Vietnam and North Korea. The files include three formally secret CIA histories in which CIA historians tell the story of the Oxcart A-12.

CIA A-12 FLIGHT LOGS

568 pages of flight logs dating from 3/20/1963 to 9/16/1967, covering test flights of the A-12 taking place at Andrews Air Force Base and Groom Lake Nevada, commonly referred to as Area 51.

CIA A-12 MANUALS

784 pages of CIA manuals covering the Lockheed A-12 Oxcart. The six manuals include: A-12 Utility Flight Manual 6.15.1968, Pilot's Abbreviated Checklist - Modified Aircraft (1965), Pilot Photographic Equipment Manual (1963), A-12 Ground Crew Manual (1966), Support Manual Ground Handling Normal and Emergency Operations and Photographic Equipment Manual (1964).

The contents of the 459 page A-12 Utility Flight Manual dated June 15, 1968 include:

DESCRIPTION: The Aircraft, Engine and After Burner, Air Inlet System, Fuel Supply System, Air Refueling System, Electrical Power Supply System, Hydraulic Power Supply System, Flight Control System, Automatic Flight Control System, Stability Augmentation System, Pitot State System, Air Data Computer, Instruments, Emergency Equipment, Landing Gear System, Nosewheel System, Drag Chute System, Air Conditioning and Pressurization System, Oxygen Systems and Personal Equipment, Windshield, Canopy, Ejection Seat.

NORMAL PROCEDURES: Preparations For Flight, Preflight Check, Starting Engines, Before Taxing, Taxing, Before Takeoff, Takeoff, After Takeoff, Normal Climb, Alternate Climb, Cruise, Prior To Descent, Air Refueling, Before Landing, Landing, G0-Around, After Landing, Engine Shutdown, Abbreviated Checklist.

EMGERGENCY PROCEDURES: INTRODUCTION: Use of Checklists, Definitions Of Landing Situations. GROUND OPERATION: Engine Fire, Abandoning The Aircraft, Brake, Steering, Or Tire Failure, Emergency Entrance. TAKEOFF EMGERGENCIES: Engine Failure, Double Engine Failure, Double Engine Failure, Afterburner Failure, Afterburner Nozzle Failure, Fire Warning-Takeoff Refused, Abort, Drag Chute Failure, Fuel Pressure Low, Main Or Nose Gear Tire Failure. Emergency Gear Retraction. IN-FLIGHT EMERGENCIES: Emergency Escape: Before Ejection, After Ejection, Parachute Landings, Bailout With Seat Inoperative, Fire Warning In-Flight, Emergency Decent, Fuel Dumping Procedures, Forced Landing Or Ditching LANDING EMERGENCIES: Single Engine Landing, Landing Gear Emergencies.

AUXILIARY EQUIPMENT: Communications and Associated Electrical Equipment, Lighting Equipment, Flight Recorder, Dictate Tape Recorder, Autopilot System, Navigation Equipment, Inertial Navigation System, Periscope, Destruct System.

OPERATING LIMITATIONS: Instrument Markings, Engine Operating Limits, Maximum Weight Limits, Maximum Altitude, Limit Airspeeds, Load Factor Limits, Prohibited Maneuvers, Center of Gravity Limitations, Aircraft System Limitations.

FLIGHT CARACTERISTICS: Configuration Effects, Stability Characteristics, High Angle of Attack Conditions, Spins, Control Effectiveness, Single Engine.

SYSTEM OPERATIONS: Engine, Inlet System Operation, Fuel System Operation, In-flight Refueling, Subsonic Cruise Fuel Management, Flight Control System, Brake System Operation.

ALL WEATHER OPERATION: Ice and Rain, Turbulence and Thunderstorms, Cold and Hot Weather Procedures, Night Flying.

CIA BLACK SHIELD MISSION REPORTS

558 pages of Lockheed Oxcart A-12 Black Shield mission reports. The nine reports date from 5/31/1967 to 1/26/1968. They cover reconnaissance fly-overs of North Vietnam, China, Laos, and North Korea.

Missions over China concentrated on military installations, urban

complexes, basic services, storage, urban complexes, electronics/ communications, air installations and naval/port facilities.

Missions flown over North Vietnam concentrated on surface-to-surface missile equipment, surface-to-air sites, electronics/communications, industry, basic services, naval/port facilities, storage, CBR warfare and urban complexes.

Missions over North Korea concentrated on missiles, air installations, military installations, electronics/communications, industry, basic services, ports and harbors, storage and urban complexes. CIA Black Shield Mission BX6847 sought information concerning the USS Pueblo.

HISTORY OF THE A-12

The U-2 dated from 1954. When its development began under the direction of a group headed by Richard M. Bissell of the CIA. Before the U-2 became operational in June 1956, CIA project officials had estimated that its life expectancy for flying safely over the Soviet Union would be between 18 months and two years. After overflights began and the Soviets demonstrated the capability of tracking and attempting to intercept the U-2, this estimate seemed too optimistic. By August 1956, Richard Bissell was so concerned about the U-2's vulnerability that he despaired of its ability to avoid destruction for six months, let alone two years. By the autumn of 1957, Bissell had collected so many ideas for a successor to the U-2, that Bissell asked the Director of Central Intelligence Allen Dulles for permission to establish an advisory committee, which became known as the Land Committee, to assist in the selection process. Bissell also felt that the support of a committee of prominent scientists and engineers would prove useful when it came time to ask for funding for such an expensive project.

The two most prominent firms involved in the search for a new aircraft were the Lockheed Corporation, which had designed the successful U-2, and Convair which was building the supersonic B-58 "Hustler" bomber for the Air force and also working on an even faster model known as the B-58B "Super Hustler". Early in 1958, Richard Bissell asked officials from both firms to submit designs for a high-speed reconnaissance aircraft. During the spring and summer of 1958, both firms worked on designs and concepts without government contracts or funds.

Following extended discussions with Bissell on the subject of a supersonic successor to the U-2, Lockheed's Kelly Johnson began

designing an aircraft that would cruise at Mach 3.0 at altitudes above 90,000 feet. On 23 July 1958, Johnson presented his new high-speed concept to Land's advisory committee, which expressed interested in the approach he was taking. At the same meeting, Navy representatives presented a concept for a high-altitude reconnaissance vehicle that examined the possibility of developing a ramjet-powered, inflatable, rubber vehicle that would be lifted to altitude by a balloon and then be propelled by a rocket to a speed where the ramjets could produce thrust. Richard Bissell asked Johnson to evaluate this concept, and three weeks later, after receiving more details from the Navy representatives, Kelly Johnson made some quick calculations that showed that the design was impractical because the balloon would have to be a mile in diameter to lift the vehicle, which in turn would need a wing surface greater than one-seventh of an acre to carry the payload.

In September 1958, the Land committee met again to review all the concepts then under consideration and to narrow out the few that were most practicable. Among the concepts rejected were the Navy's proposal for an inflatable, ramjet-powered aircraft, a Boeing proposal for a 190-foot-long hydrogen-powered inflatable aircraft, and a Lockheed design for a hydrogen-powered aircraft (the CL-400). The committee examined two other Kelly Johnson designs at this meeting, a tailless subsonic aircraft with a very-low-radar cross section (the G2A) and a new supersonic design (the A-2) and did not accept either one, the former because of its slow speed and the latter because of it dependence on exotic fuels for its ramjets and it overall high cost. The committee approved the continuation of Convair's work on a ramjet-powered Mach 4.0 "parasite" aircraft that would be launched from a specially configured version of the B-58B bomber. The design was termed a parasite because it could not take off on its own but needed a larger aircraft to carry it aloft and accelerate it to the speed required to start the ramjet engine. The Convair design was called the FISH.

Two months later, after reviewing the Convair proposal and yet another Lockheed design for a high-speed reconnaissance aircraft (the A-3), the Land committee concluded in late November 1958 that it would indeed be feasible to build an aircraft whose speed and altitude would make radar tracking difficult or impossible. The committee, therefore, recommended that DCI Dulles ask President Eisenhower to approve further pursuit of the project and to provide fund for additional studies and tests.

On 17 December 1958, Allen Dulles and Richard Bissell briefed the President on the progress toward a successor to the U-2. Also present were Land and Purcell from the advisory committee, Presidential Service Advisor James Killian, and Air Force Secretary Donald Quarles. DCI Dulles reviewed the results to the U-2 missions to date and stated his belief that a successor to the U-2 could be used all over the

world and "would have a much greater invulnerability to detection"

Bissell then described two competing projects by Lockheed and Convair, noting that the chief question at the moment was whether to use air launch or ground takeoff. The next phase, he added, would be detailed engineering, at the end of which it was proposed that 12 aircraft be ordered at a cost of about $100 million. With funding for the proposed new type of aircraft now available, Richard Bissell asked Lockheed and Convair to submit detailed proposals.

By the summer of 1959, both firms had completed their proposals. In early June, Lockheed submitted a design for the ground-launched aircraft known as the A-11. It would have a speed of Mach 3.2, a range of 3,200 miles, an altitude of 90,000 feet, and a completion date of January 1961. Kelly Johnson had refused to reduce the aerodynamics of his design in order to achieve a greater anti-radar capability, and the A-11's radar cross section, although not great, was substantially larger than that of the much smaller parasite aircraft being designed by Convair.

The Convair proposal called for a small, manned, ramjet-powered, reconnaissance vehicle to be air launched from one of two specially configured B-58B Super Hustlers. The FISH vehicle, a radical lifting body with a very-small-radar cross section, would fly at Mach 4.2 at 90,000 feet and have a range of 3,900 miles. Two Marquardt ramjets would power its Mach 4.2 dash over the target area. Once the FISH decelerated, two Pratt & Whitney JT-12 turbojets would bring it back to base. The ramjet exit nozzles and wing edges would be constructed of Pyroceram, a ceramic material that could withstand the high temperatures of very high speeds and would absorb radio frequency energy from the radar pulses. Convair stated that the FISH could be ready by January 1961.

Convair's proposal depended on two uncertain factors. First and foremost was the unproven technology of the ramjet engines. At the time, no aircraft in existence could carry a large, ramjet-powered aircraft into the sky and then accelerate to sufficient speed for the ramjet engines to be ignited. Since ramjet engines had only been tested in wind tunnels, there was no available data to prove that these engines would work in the application proposed by Convair. The second uncertain factor was the B-58B bomber that was supposed to achieve Mach 2.2 before launching the FISH above 35,000 feet. The version of the B-58 was still in the design stage.

Convair's proposal suffered a major setback in June 1959, when the Air Force canceled the B-58B project. Conversion of the older, slower B-58A into the supersonic launching platform for the FISH was ruled out by the high cost and technical difficulties involved. Moreover, the Air Force was unwilling to part with two aircraft from the small inventory of its most advanced bomber. Even had the B-58B program not

been canceled, the FISH proposal would probably not have been feasible. Convair engineers had calculated that the added weight of the FISH would prevent the B-58B from achieving the speed required to ignite the parasite aircraft's ramjet engines.

The Convair proposal was therefore unusable, but the Lockheed design with its high radar cross section was also unacceptable to the Land committee. On 14 July 1959, the committee rejected both designs and continued the competition. Lockheed continued to work on developing a design that would be less vulnerable to detection, and Convair received a new CIA contract to design an air-breathing twin-engine aircraft that would meet the general specifications being followed by Lockheed.

Following recommendations by the Land committee, both Lockheed and Convair incorporated the Pratt & Whitney J58 power plant into their designs. This engine had originally been developed for the Navy's large, jet-powered flying boat, the Glenn L. Martin Company's P6M Seamaster, and was the most powerful engine available. In 1958 the Navy had canceled the Seamaster program, which left Pratt & Whitney without a buyer for the powerful J58 engine.

Although the Land committee had not yet found an acceptable design, it informed President Eisenhower on 20 July 1959 that the search was making good process. Concerned about the U-2's vulnerability to detection and possible interception and aware that the photo satellite project was encountering significant problems, the President gave his final approval to the high-speed reconnaissance aircraft project.

By the late summer of 1959, both Convair and Lockheed had completed new designs for a follow-on to the U-2. Convair's entry, known as the KINGFISH, used much of the technology developed for the F-102, F-106, and B-58, including stainless steel honeycomb skin, planiform wing design, and crew capsule system, which eliminated the need for the pilot to wear a pressurized suit. The KINGFISH had two side-by-side J58 engines inside the fuselage, which significantly reduced the radar cross section. Two additional important design features that contributed to a small radar return were fiberglass engine inlets and wings whose leading edges were made of Pyroceram.

Lockheed's new entry was much like its first, but with several modifications and a new designator, A-12. It too, would employ two of the powerful J58 engines. Lockheed's major innovation in reducing radar return was a cesium additive in the fuel, which decreased the radar cross section of the afterburner plume. This improvement had been proposed by Edward Purcell of the Land committee. Desiring to save weight, Kelly Johnson had decided not to construct the A-12 out of steel. Traditional lightweight metals such as aluminum were out of the question because they could not stand the heat that would be generated as the A-12 flew at Mach 3.2, so Johnson chose a titanium

alloy.

On 20 August 1959, Lockheed and Convair submitted their proposals to a joint Department of Defense, Air Force, and CIA selection panel. The two aircraft were similar in performance characteristics, although the Lockheed design's specifications were slightly better in each category. The Lockheed design was also preferable in terms of overall cost. In the vital area of vulnerability to radar detection, however, the Convair design was superior. Its smaller size and internally mounted engines gave it a smaller radar cross section than the Lockheed A-12.

Some of the CIA representatives initially favored the Convair KINGFISH design because of its smaller radar cross section, but they were eventually convinced to support the Lockheed design by the Air Force members of the panel, who believed that Convair's cost over-runs and production delays on the B-58 project might be repeated in this new project. In contrast, Lockheed had produced the U-2 under budget and on time. Another factor favoring the A-12 was security. Lockheed had experience in running a highly secure facility (the Skunk Works) in which all of the key employees were already cleared by the Central Intelligence Agency.

The CIA selected Lockheed's A-12 over a Convair proposal called KINGFISH.

Despite its vote in favor of the Lockheed proposal, the selection panel remained concerned about the A-12's vulnerability to radar detection and therefore required Lockheed to prove its concept for reducing the A-12's radar cross section by 1 January 1960. On 14 September 1959, the CIA awarded a four-month contract to Lockheed to proceed with anti-radar studies, aerodynamic structural tests, and engineering designs. This research and all later work on the A-12 took place under a new codename, Project OXCART, established at the end of August 1959 to replace its more widely known predecessor, Project GUSTO.

By mid-January 1960, Lockheed had demonstrated that its concept of shape, fuel additive, and non-metallic parts would reduce the OXCART's radar cross section substantially. Richard Bissell, however, was very upset to learn that the changes had led to a reduction in the aircraft's performance, which meant it would not be able to attain the penetration altitude he had promised to President Eisenhower. Kelly Johnson then proposed to reduce the aircraft's weight by 1,000 pounds and increase the fuel load by 2,000 pounds, making it possible to achieve the target altitude of 90,000 feet. Afterward, he noted in the project log: "We have no performance margins left; so this project instead of being 10 times as hard as anything we have done, is 12 times as hard. This matches the design number and is obviously right". Johnson, "Archangel log", 21 January 1960.

These changes satisfied Bissell, who notified Johnson on 26 January that the CIA was authorizing the construction of 12 of the new aircraft. The actual contract was signed on 11 February 1960. Lockheed's original quotation for the project was $96.6 million for 12 aircraft, but technological difficulties eventually made this price impossible to meet. Recognizing that fabricating an aircraft from titanium might involve unforeseen difficulties, the CIA included a clause in the contract that allowed costs to be reevaluated. During the next five years, this clause had to be invoked on a number of occasions as the A-12's costs soared to more than double the original estimate.

From the very beginning, it was clear that Lockheed could not test the OXCART aircraft at its Burbank "Skunk Works" facility, where the runway was too short and too exposed to the public. The ideal testing site would be far removed from metropolitan areas, away from civil and military airways, easily accessible by air, blessed with good weather, capable of accommodating large numbers of personnel, near an Air Force installation, and having a runway at least 8,000 feet long. But no such place was to be found.

After considering 10 Air Force bases programmed for closing, Richard Bissell decided on the Groom Lake facility, commonly known as Area 51. Although its personnel accommodations, fuel storage capacity, and runway length were insufficient for the OXCART program, the site's remote location would greatly ease the task of maintaining the program's security, and a moderate construction program could provide adequate facilities. Construction began in September 1960; a C-47 shuttle service ferried work crews from Burbank to Las Vegas and from Las Vegas to the site.

The new 8,500 foot runway was completed by 15 November 1960. Kelly Johnson had been reluctant to have a standard Air Force runway with expansion joints every 25 feet, because he feared the joints would set up undesirable vibrations in the speedy aircraft. At his suggestion a 150-foot wide longitudinal section, each 150 feet long but staggered was used instead. This layout put most of the expansion joints parallel to the direction of aircraft roll and reduced the frequency of the joints.

Additional improvements included the resurfacing of 18 miles of highway leading to the base so that heavy fuel trucks could bring in the necessary fuel. The need for additional buildings on the base was met by the Navy. Three surplus Navy hangers were dismantled, moved, and reassembled on the north side of the base, and more than 100 surplus Navy housing buildings were also transported to Groom Lake, Nevada. All essential facilities were ready in time for the forecast delivery date of the first A-12 on 1 August 1961.

The first A-12, known as Article 121, was assembled and tested at Burbank during January and February 1962. After development and production at the Skunk Works, in Burbank, California, the first A-12 was transferred to Groom Lake test facility, commonly known as Area 51.

Since it could not be flown to the Groom Lake facility, the aircraft had to be partially disassembled and put on a specially designed trailer that cost nearly $100,000. The entire fuselage, without wings, was crated and covered, creating a load 35 feet wide and 105 feet long. To transport this huge load safely over the hundreds of miles to the site, obstructing road signs were removed, trees were trimmed, and some roadblocks had to be leveled. The plane left Burbank on 26 February 1962 and arrived two days later.

Lockheed test pilot Lou Schalk took the A-12 on its shakedown flight. On 25 April 1962, Schalk took "article 121" for an unofficial unannounced flight, which was an old Lockheed tradition. He flew the craft less than two miles at an altitude of about 20 feet and encountered considerable problems because of the improper hookup of several controls. These were promptly repaired and on the next day, 26 April, Schalk made a 40-minute flight. After a beautiful takeoff, the aircraft began shedding the triangular fillets that covered the framework of the chines along the edge of the aircraft body. The lost fillets, which had been secured to the airframe with epoxy resin, had to be recovered and re-affixed, a process that took the next four days.

The first official flight occurred on 30 April. Once the fillets were in place, the OXCART's official first flight took place, witnessed by a number of Central Intelligence Agency officials. This official first flight was also the first flight with the wheels up. Piloted again by Schalk, the OXCART took off at 170 knots and climbed to 30,000 feet. During the 59 minute flight, the A-12 achieved a top speed of 340 knots. Kelly Johnson declared it to be the smoothest first test flight of any aircraft he had designed or tested. On 2 May 1962, during the second test flight, the OXCART broke the sound barrier, achieving a speed of Mach 1.1.

Four more aircraft, including a two-seat trainer, arrived at the testing site before the end of the year. During the second delivery on 26 June 1962, the extra-wide vehicle carrying the aircraft accidentally struck a Greyhound bus traveling in the opposite direction. Project managers quickly authorized payment of $4,890 for the damage done to the bus in order to avoid having to explain in court why the OXCART delivery vehicle was so wide.

On October 5, 1962, with the newly developed J58 engines, the A-12 flew with one J75 engine, and one J58 engine. During 1963 these J58-equipped A-12s obtained speeds of Mach 3.2. Also, in 1963, the program

experienced its first Blackbird loss. The first A-12 crash occurred on 24 May 1963, when a detachment pilot, realizing the airspeed indication was confusing and erroneous, decided to eject. The pilot was unhurt, but the plane was destroyed when it crashed near Wendover, Utah. A cover story for the press described the plane as an F-105. All A-12s were grounded for a week while the accident was investigated. The malfunction was found to be caused by ice that plugged up the pitot-static tube used to determine airspeed.

In June of 1964, the last A-12 was delivered to Groom Lake. A total of 18 aircraft were built through the A-12 program production run. Of these, 13 were A-12s, three were YF-12A interceptors for the Air Force (not funded under the OXCART program), and two were M-21s. One of the 13 A-12s was a dedicated trainer aircraft with a second, higher seat.

The YF-12 program was a limited production variant of the A-12 OXCART spy plane designed for the CIA and first flown in 1962. Lockheed was able to convince the U.S. Air Force that an aircraft based on the A-12 would provide a less costly alternative to the recently cancelled North American Aviation XF-108, since much of the design and development work on the YF-12 had already been done and paid for. Thus, in 1960 the Air Force agreed to take the 11th through 13th slots on the A-12 production line and have them completed in the YF-12A interceptor configuration. The main changes involved modifying the aircraft's nose to accommodate the Hughes AN/ASG-18 fire-control radar originally developed for the XF-108, and the addition of a second cockpit for a crewmember to operate the fire control radar. The nose modifications changed the aircraft's aerodynamics enough to require ventral fins to be mounted under the fuselage and engine nacelles to maintain stability. Finally, bays previously used to house the A-12's reconnaissance equipment were converted to carry missiles.

Two more A-12s were lost in later testing. On 9 July 1964, article 133 crashed while landing when a pitch-control servo device froze, rolling the plane into a wing-down position. Ejecting from a altitude of 129 feet, the pilot was blown sideways out of the craft. Although he was not very high off the ground, his parachute did open and he landed during the parachute's first swing. Fortunately he was unhurt, and no news of the accident filtered out of the base. Eighteen months later, on 28 December 1965, article 126 crashed immediately after takeoff because of an improperly wired stability augmentation system. As in the previous crash, the pilot ejected safely, and there was no publicity connected with the crash. An investigation ordered by Director of Central Intelligence John McCone, determined that the wiring error had resulted from negligence, not sabotage.

The A-12 made its first long-range, high speed flight on 27 January 1965. The flight lasted 100 minutes, with 75 minutes of which were flown at speeds greater than Mach 3.1, and the aircraft covered 2,850 miles at altitudes of between 75,600 and 80,000 feet. By this time,

the OXCART was performing well. The engine inlet, camera, hydraulic, navigation, and flight-control systems all demonstrated acceptable reliability.

Nevertheless, as the OXCART began flying longer, faster, and higher, new problems arose. The most serious of these problems involved the aircraft's wiring. Continuing malfunctions of the inlet controls, communications equipment, ECM systems, and cockpit instruments were often attributable to wiring failures. Wiring connectors and components had to withstand temperatures above 800 deg. F, structural flexing, vibration, and shock. Such demands were more than the materials could stand. Not all of the OXCART's problems could be traced to material failures, however, and CIA officials believed that careless maintenance by Lockheed employees also contributed to malfunctions.

Concerned that Lockheed would not be able to meet the OXCART's schedule for operational readiness, the Office of Special Activities' Director of Technology met with Kelly Johnson on 3 August 1965 to discuss the project's problems. Johnson not only assigned more top-level supervisors to the project but also decided to go to the base and take charge of the OXCART's development himself. His presence made a big difference, as can be seen in his notes in the project log: "I uncovered many items of a managerial, materiel and design nature.... I had meetings with vendors to improve their operation.... Changed supervision and had daily talks with them, going over in detail all problems on the aircraft.... Increased the supervision in the electrical group by 500%.... We tightened up the inspection procedures a great deal and made inspection stick. It appears that the problems are one-third due to bum engineering.... The addition of so many systems to the A-12 has greatly complicated the problems, but we did solve the overall problem."

By 20 November 1965, the final validation flights for OXCART deployment were finished. During these tests, the OXCART achieved a maximum speed of Mach 3.29, an altitude of 90,000 feet, and sustained flight time above Mach 3.2 of 74 minutes. The maximum endurance test lasted six hours and 20 minutes. On 22 November, Kelly Johnson wrote to the head of the Office of Special Activities, stating, "The time has come when the bird should leave its nest."

Three years and seven months after its first flight in April 1962, the OXCART A-12 was ready for operational use. It was now time to find work for the most advanced aircraft ever conceived and built.

Although the OXCART had been designed to replace the U-2 as a strategic reconnaissance aircraft to fly over the Soviet Union, this use had become doubtful long before the OXCART was ready for operational use. The U-2 Affair of 1960 made Presidents very reluctant to consider overflights of the Soviet Union. Indeed, Presidents

Eisenhower and Kennedy had both stated publicly that the United States would not conduct such overflights. In July 1962, Secretary of Defense McNamara told DCI McCone that he doubted that the OXCART would ever be used and suggested that improvements in another overhead reconnaissance program would very likely eliminate the need for the expensive OXCART program. Strongly disagreeing, McCone told McNamara that he had every intention of using OXCART aircraft to fly over the Soviet Union.

McCone raised this issue with President Kennedy in April 1963, at a time when the nation's chief overhead reconnaissance devices were experiencing a great number of failures and the intelligence community was clamoring for better photography to confirm or disprove allegations of the existence of an anti-ballistic missile system at Leningrad. Unconvinced by McCone's arguments for OXCART overflights, President Kennedy expressed the hope that some means might be devised for improving other methods instead.

In the months after the Cuban Missile Crisis the A-12 was never deemed suitable for use over Cuba. As the OXCART's performance and equipment continued to improve, there was renewed consideration of deploying the aircraft overseas, particularly in Asia, where US military activity was increasing. On 18 March 1965, DCI McCone, Secretary of Defense McNamara, and Deputy Secretary of Defense Vance discussed the growing hazards confronting current aerial reconnaissance methods.

In the summer of 1965, after the United States had begun introducing large numbers of troops into South Vietnam, Southeast Asia became another possible target for the OXCART. Because the continued use of U-2s for reconnaissance missions over North Vietnam was threatened by the deployment of Soviet-made surface-to-air missiles, McNamara asked the CIA on 3 June 1965 whether it would be possible to substitute OXCART aircraft for U-2s. The new DCI Adm. William F. Raborn, replied that the OXCART could operate over Vietnam as soon as it passed its final operational readiness tests.

Project BLACK SHIELD, the plan for Far East operations, called for OXCART aircraft to be based at Kadena airbase on Okinawa. In the first phase, three planes would be flown to Okinawa for 60-day periods, twice a year, an operation which would involve 225 personnel. Later there would be a permanent detachment at Kadena. In preparation for the possibility of such operations, the Department of Defense spent $3.7 million to provide support facilities and real-time secure communications on the island by early autumn 1965.

There the matter remained for more than a year. During the first half of 1966, DCI Raborn raised the issue of deploying the OXCART to Okinawa at five separate 303 Committee meetings but failed to win sufficient support. The JCS and PFIAB supported the CIA's advocacy of OXCART deployment. Top State and Defense Department officials,

however, thought that the political risks of basing the aircraft in Okinawa—which would almost certainly disclose it to the Japanese—outweighed any gains from the intelligence the OXCART might gather. On 12 August 1966, the divergent views were presented to President Johnson, who upheld the 303 Committee's majority opinion against deployment for the time being.

With operational missions still ruled out, proficiency training remained the main order of business. This led to improvements in mission plans and flight tactics that enabled the detachment to reduce the time required to deploy to Okinawa from 21 days to 15. Records continued to fall to the OXCART. On 21 December 1966, a Lockheed test pilot flew an A-12 for 16,408 kilometers over the continental United States in slightly more than six hours, for an average speed of 2,679 kilometers per hour (which included in-flight refueling at low speeds as low as 970 kilometers per hour). This flight set a record for speed and distance unapproachable by any other aircraft.

On December 28, 1966, the decision was made to terminate A-12 operations by 1 June 1968.

On 5 January 1967, an A-12 crashed after a fuel gauge malfunctioned and the aircraft ran out of fuel short of the runway. The pilot ejected, but was killed, when he could not become separated from the ejection seat. To preserve the secrecy of the OXCART program, the Air Force informed the press that an SR-71 was missing and presumed lost in Nevada. This loss, like the three preceding crashes, did not result from difficulties caused by high-speed, high-temperature flight but from traditional problems inherent in any aircraft.

A proposal was made to have Project Black Shield use the OXCART to collect tactical rather than strategic intelligence. The cause was apprehension in Washington about the possible undetected introduction of surface-to-air missiles into North Vietnam. When President Johnson asked for a proposal on the matter, the CIA suggested that the OXCART be used. While the State and Defense Departments were still examining the proposal's political risks, DCI Richard Helms raised the issue at President Johnson's "Tuesday lunch" on 16 May. Helms got the President's approval, and the CIA put the BLACK SHIELD plan to deploy the OXCART to the Far East into effect later that same day.

In May of 1967, A-12s were flown to Kadena Air Base on Okinawa, Japan and the BLACK SHIELD unit was declared operational. The airlift of personnel and equipment to Kadena began on 17 May 1967, and on 22 May the first A-12 flew nonstop to Kadena in six hours and six minutes, A second aircraft arrived on 24 May. The third A-12 left on 26 May, but the pilot had trouble with the inertial navigation system and communications near Wake Island. He made a precautionary landing at Wake, where a pre-positioned emergency recovery team was located. The problem was corrected and the aircraft continued on its flight to

Kadena on the following day.

By 29 May 1967, 13 days after President Johnson's approval, Black Shield was ready to fly an operational mission. On 30 May, the detachment was alerted for a mission on the following day. Mel Vojvodich flew the first Black Shield operation, over North Vietnam. As the takeoff time approached, Kadena was being deluged by rain, but, since weather over the target area was clear, flight preparations continued. The OXCART, which had never operated in heavy rain, taxied to the runway and took off.

The first BLACK SHIELD mission flew one flight path over North Vietnam and another over the demilitarized zone (DMZ). The mission was flown at Mach 3.1 and 80,000 feet and lasted three hours and 39 minutes. While over North Vietnam, the A-12 photographed 70 of the 190 known surface-to-air sites and nine other priority targets. The A-12's ECM equipment did not detect any radar signals during the mission, which indicated that the flight had gone completely unnoticed by both the Chinese and North Vietnamese.

During the next six weeks, there were more alerts for 15 BLACK SHIELD missions, seven of which were flown. Only four detected hostile radar signals. By mid-July 1967, the BLACK SHIELD missions had provided sufficient evidence for analysts to conclude that no surface-to-air missiles had been deployed in North Vietnam. From Kadena, during 1967, the A-12s conducted 22 operations in support of the Vietnam War. During its deployment on Okinawa, the A-12s (and later the SR-71) and by extension their pilots, were nicknamed Habu after a cobra-like Okinawan pit viper which the locals thought the plane resembled.

A typical mission over North Vietnam required refueling south of Okinawa, shortly after takeoff. After the planned photographic passes, the aircraft withdrew for a second aerial refueling in the Thailand area before returning to Kadena. So great was the plane's speed that it spent only 12.5 minutes during a "single-pass" mission, and 21.5 minutes during a "two-pass" mission. Because of its wide 86-mile turning radius, the plane occasionally crossed borders when getting into position for a second pass.

After the aircraft landed, the camera film was removed and sent by special plane to processing facilities in the United States. By late summer, however, an Air Force photo laboratory in Japan began doing the processing in order to place the photo-intelligence in the hands of US commanders in Vietnam within 24 hours of a mission's completion.

On 17 September 1967 one SAM site tracked the vehicle with its acquisition radar but was unsuccessful with its FAN SONG guidance radar. It was not until 28 October that a North Vietnamese SAM site launched a missile at the OXCART. Mission photography documented the event with photographs of missile smoke and its contrail. Electronic

countermeasures aboard the OXCART performed well, and the missile did not endanger the aircraft.

During 1968, Black Shield conducted numerous operations in Vietnam and also supported the Pueblo Crisis. In February of 1968, in preparation for the replacement of the A-12 by the SR-71, Lockheed was ordered to destroy all tooling used to create the A-12 Blackbirds. Also during this year, the first SR-71 arrived at Kadena to replace the A-12s. On May 8, over North Korea, the last operational mission of an A-12 was undertaken. Subsequently, all deployed A-12s were sent back to Palmdale, California, where they joined the remainder of the A-12 fleet, and all were placed in storage.

On May 8, Jack Layton flew the final mission of the A-12s, after which they were retired from active service and replaced by the SR-71. In the just over one year duration of Operation Black Shield, the A-12s flew 29 operational sorties. On June 4, shortly after operations ceased and just two-and-a-half weeks before the retirement of the entire A-12 fleet, an A-12 out of Kadena, piloted by Jack Weeks, was lost over the Pacific Ocean near the Philippines while conducting a functional check flight after the replacement of one of the craft's engines. Search and rescue missions found no trace of the plane or its pilot.

On June 21, 1968, pilot Frank Murray took the final A-12 flight, to Palmdale, California.

The OXCART was the last high-altitude reconnaissance aircraft produced for the CIA, although the Office of Special Activities did briefly consider several possible successors to the OXCART during the mid-1960ís. The first of these, known as Project ISINGLASS, was prepared by General Dynamics to utilize technology developed for its Convair Divisions earlier FISH proposal and its new F-111 fighter in order to create an aircraft capable of Mach 4-5 at 100,000 feet. General Dynamics completed its feasibility study in the fall of 1964, and OSA took no further action because the proposed aircraft would still be vulnerable to existing Soviet countermeasures. In 1965 a more ambitious design from McDonnell Aircraft came under consideration as Project RHEINBERRY (although some of the work seems to have come under the ISINGLASS designation as well). This proposal featured a rocket-powered aircraft that would be launched from a B-52 mother ship and ultimately reach speeds as high as Mach 20 and altitudes of up to 200,000 feet. Because building this aircraft would have involved tremendous technical challenges and correspondingly high costs, the Agency was not willing to embark on such a program at a time when the main emphasis in overhead reconnaissance had shifted from aircraft to satellites. As a result, when the OXCART program ended in the summer of 1968, no more advanced successor was waiting in the wings, only the veteran U2.

Intended to replace the U-2 as a collector of strategic intelligence, the OXCART was never used for this purpose, its brief deployment was strictly for obtaining tactical intelligence and its photographic product contributed very little to the CIA's strategic intelligence mission. By the time OXCART became operational other reconnaissance methods had filled the role originally conceived for it. The most advanced aircraft of the 20th century had become an anachronism before it was ever used operationally. On 26 January 1967 Kelly Johnson noted in his "Archangel log": I think back in 1959, before we started this airplane, in discussions with Dick Bissell where we seriously considered the problem of whether there would be one more round of aircraft before the satellites took over. We jointly agreed there would be just one round and not two. That seems to have been a very accurate evaluation, as it seems that 30 SR-71's gives us enough overflight reconnaissance capability and we don't need the additional 10 Oxcart aircraft.

The OXCART did not even outlast the U-2, the aircraft it was supposed to replace. The OXCART lacked the quick-response capability of the smaller craft: a U2 unit could be activated overnight, and within a week it could deploy abroad, fly sorties, and return home base. The OXCART planes required precise logistic planning for fuel and emergency landing fields, and their inertial guidance systems needed several days for programming and stabilization. Aerial tankers had to be deployed in advance along OXCART's flight route and be provisioned with the highly specialized fuel used by the J58 engines. All of this required a great deal of time and the effort of several hundred people. A U-2 mission could be planned and flown with a third fewer personnel.

Although the OXCART program created a strategic reconnaissance aircraft with unprecedented speed, range, and altitude, the program's most important contributions lay in other areas: aerodynamic design, high-impact plastics, engine performance, cameras, electronic countermeasures, pilot life-support systems, anti-radar devices, use of nonmetallic materials for the major aircraft assemblies, and improvements in milling, machining, and shaping titanium. In all of these areas, the OXCART pushed back the frontiers of aerospace technology and helped lay the foundation for future "stealth" research.