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The Area 51 File: Secret Aircraft and Soviet MiGs – Declassified Documents Describe Stealth Facility in Nevada

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Washington, D.C., October 29, 2013 – The CIA's history of the U-2 spy plane, declassified this past summer, sparked enormous public attention to the U-2's secret test site at Area 51 in Nevada, but documents posted today by the National Security Archive (www.nsarchive.org) show that Area 51 played an even more central role in the development of the U.S. Air Force's top secret stealth programs in the 1970s and 1980s, and hosted secretly obtained Soviet MiG fighters during the Cold War.

Compiled and edited by Archive senior fellow Jeffrey T. Richelson, today's e-book posting includes more than 60 declassified documents. Some of the documents specifically focus on Area 51 and the concern for maintaining secrecy about activities at the facility. Included is a 1961 memo (Document 1) from the CIA's inspector general raising the issue of security, and a response (Document 2) reporting the shared concerns of the CIA Deputy Director for Plans, Richard Bissell. Security concerns led to consideration (Document 3) of photographing the area with U.S. reconnaissance assets and a debate (Document 4, Document 5) over the possible release of a photograph of the facility taken by SKYLAB astronauts.

Bird of Prey. Photo credit: National Museum of the United States Air Force.

Other documents focus on the aircraft tested at the facility (and their operational use) — particularly the stealth F-117. Those documents include a variety of histories of the F-117 squadron, with details on participation in operations and exercises. In addition, there are extracts from two reports (Document 15, Document 16) on accidents involving F-117

aircraft, as well as histories and assessments (Document 17, Document 18,Document 23, Document 36) of F-117 deployment in operations DESERT STORM and IRAQI FREEDOM. Also included are fact sheets (Document 58, Document 59, Document 60) concerning three programs, at least two of which were tested at Area 51 — the Bird of Prey and TACIT BLUE.

In addition to documents on F-117 operations, a number of documents focus on the development of stealth capability. One of those (Document 10), is the mathematical analysis by Russian physicist and engineer P. Ya. Ufimtsev that former Lockheed Skunk Works director Ben Rich called "the Rosetta Stone breakthrough for stealth technology."

Also represented in the posting is another type of activity at Area 51 — the exploitation of covertly acquired Soviet MiGs. Included is a 300-page Defense Intelligence Agency report (Document 50) on the exploitation of the MiG-21, a project titled HAVE DOUGHNUT. Other documents (Document 51, Document 52) concern the exploitation effort concerning two MiG-17s, efforts named HAVE DRILL and HAVE FERRY.


TACIT BLUE. Photo credit: National Museum of the United States Air Force.

Area 51 has the been the focus of enormous interest among a significant segment of the public for decades — an interest that inevitably spawned books, articles, and a variety of documentaries.[1] For some enthusiasts Area 51 was a clandestine site for UFOs and extraterrestrials, but it is better understood as a U.S. government facility for the testing of a number of U.S. secret aircraft projects — including the U-2, OXCART, and the F-117. Declassified documents help demonstrate the central role that Area 51 played in the development of programs such as the F-117, and the operational employment of the aircraft. Other declassified documents reveal Area 51's role in testing foreign radar systems and, during the Cold War, secretly obtained Soviet MiG fighters.

Area 51

On April 12, 1955 Richard Bissell and Col. Osmund Ritland flew over Nevada with Kelly Johnson in a small Beechcraft plane. Johnson was the director of the Lockheed Corporation's Skunk Works, which, as part of a secret CIA-Air Force project, codenamed AQUATONE by the CIA and OILSTONE by the Air Force, was building a revolutionary spy plane, designated the U-2. Bissell, CIA head of the project, Ritland his Air Force deputy, Johnson, and Lockheed's chief test pilot, were looking for a site where the plane could be tested safely and secretly.[2]

During the trip they discovered, near the northeast corner of the Atomic Energy

Commission's (AEC) Nevada Proving Ground, what appeared to be an airstrip near a salt flat known as Groom Lake. After examining the location from the ground, the four agreed that it "would make an ideal site for testing the U-2 and training its pilots." Upon returning to Washington, Bissell discovered that the land was not part of the AEC's proving ground — leading him to ask the commission's chairman to make the Groom Lake area an AEC possession, a request which was readily granted. President Eisenhower approved the plan, and the territory, known by its map designation — Area 51 — was added to the Nevada Test Site.[3] The site acquired several other designations. Kelly Johnson, in order to make the remote location seem more palatable his workers began referring to it as Paradise Ranch, which was then shortened to the Ranch. An additional unofficial name would be Watertown Strip — a consequence of the need to build a paved runway so that testing could continue when rainwater runoff from nearby mountains made it impossible to land on Groom Lake. By July 1955, the base was ready and personnel from the CIA, Air Force, and Lockheed began to arrive.[4]

Within a year the U-2 program would transition to an operational program, with flights initially over Eastern Europe and then the Soviet Union. Bissell and other senior officials anticipated that the U-2 would have a limited life before becoming vulnerable to Soviet air defense systems. Before the end of 1958 they had launched Project GUSTO to find a successor to the U-2, which resulted in the selection of another Lockheed-designed plane, the A-12 or OXCART— which was to fly higher than the U-2, far faster (over Mach 3), and be harder for air defense radars to detect.[5]

In November 1959, a little over two years before the first A-12 arrived at Area 51 in late December 1961, a radar test facility was established there — the result of contractor Edgerton, Germeshausen & Greer (EG&G) agreeing to move its Indian Springs, Nevada test facility to Area 51. Its purpose was to determine the vulnerability of an OXCART mockup to detection. Area 51 would also become the home to testing programs for two OXCART derivatives — the YF-12A KEDLOCK fighter plane and the Air Force's Project EARNING, which ultimately produced the SR-71 (also designated SENIOR CROWN) reconnaissance aircraft — as well as the D-21 TAGBOARD drone that was expected to be launched from A-12 aircraft.[6]

In September 1961, a few months before the first OXCART arrived, the site was visited by CIA Inspector General Lyman Kirkpatrick, who conveyed his findings (Document 1) to Richard Bissell — who had become the CIA's Deputy Director of Plans in the summer of 1958, with continued responsibility for the CIA's secret aircraft projects through his directorate's Development Projects Division (DPD). Kirkpatrick wrote that his "visit left reservations in my mind." One was that the "'Area' appears to be extremely vulnerable in its present security provisions against unauthorized observation" — including air observation. In addition, Kirkpatrick suggested that the project had reached a stage "where top management at the 'Area 51' needs consolidation with clear and precisely defined authority." Finally, he questioned "the survivability of the program's hardware when and if employed in actual operations."

Bissell's off-the-cuff reactions were reported in an October 17 memo (Document 2) from Bissell's assistant to the acting chief of the DPD. The author reported Bissell's belief that Kirkpatrick's points about area security were "well taken," his lack of strong reaction to the comment about site management, and his questioning whether the inspector general's comment about OXCART vulnerability was "appropriate" for Kirkpatrick "to get himself

involved in." With regard to the issue of security Bissell "was particularly interested in why we have not yet been able to eject the various [deleted] holding property around the Area."

Concern about maintaining secrecy for activities at the site persisted as illustrated by an April 6, 1962 memo (Document 3) from DPD executive officer John McMahon to the division's acting chief. He reported that he and another DPD official (John Parangosky) had earlier discussed the idea of employing a U-2 to produce images of the area and asking photographic interpreters to determine what was happening at the site. But given, the upcoming scheduled launches of CORONA reconnaissance satellites, McMahon noted that "it might be advisable" to include a pass crossing the Nevada Test Site, "to see what we ourselves could learn from satellite reconnaissance of the Area." That and later missions could be used to assess what deductions the Soviets could make "should Sputnik 13 have a reconnaissance capability."

A dozen years later, it was not Soviet reconnaissance that resulted in interagency discussions and memos concerning exposure of Area 51 activities via overhead imagery. Rather it was the inadvertent imaging of the area by American SKYLAB astronauts. Among the memos was one (Document 4) from Robert Singel, the National Reconnaissance Office's deputy director, concerning the on-going internal government controversy. Another memo (Document 5) provided Director of Central Intelligence William Colby with the latest information on the internal debate and identified key questions that needed to be answered before a final decision was made.[7]

During the mid-1970s another issue was whether the CIA should continue Area 51; its major aerial reconnaissance programs, such as the U-2 and OXCART, no longer needed the site, but the Air Force still needed the site for radar testing, development of stealth aircraft, and exploitation of Soviet MiG aircraft that the U.S. had acquired. The National Security Council decided that the Air Force should take over the site. According to a memo (Document 6) from deputy director of central intelligence, E.H. Knoche to the Air Force's chief of staff, David C. Jones. Knoche, the National Security Council's Committee on Foreign Intelligence had approved the recommendation "that management of Area 51 be transferred from CIA to Air Force by FY-78."

Eventually, the transfer would take place, and the Groom Lake facility became Detachment 3 of the Air Force Flight Test Center, whose headquarters were at Edwards Air Force Base, California.[8]

By the mid-1990s, the existence of Area 51 had become widely known — and the subject of threatened legal action because of environmental concerns. Seeking to prevent that from resulting in revelations about activities conducted at the site President Bill Clinton signed a presidential determination exempting the "Air Force's operating location near Groom Lake, Nevada from any Federal, State, interstate, or local hazardous or solid waste laws that might require disclosure of classified information concerning that location to unauthorized persons" — a determination he reported to congressional leaders (Document 8) on January 30, 1996. In September 2003 President George W. Bush made a similar determination, in the form of a memorandum (Document 9) to the administrator of the Environmental Protection Agency.

Stealth Fundamentals

A key element of the work done at Area 51 was testing the ability of the reconnaissance and other aircraft deployed there to evade radar detection. In some cases the work was based on measures developed after the aircraft was developed — as exemplified by the failed RAINBOW project aimed at reducing the Soviet ability to detect U-2's during their spy flights.[9] In other cases, designers gave the aircraft certain stealth (low-observable) features — in some cases, based on elaborate theoretical work.

During the mid-1970s government and contractor experts studied the problem of reducing the radar cross section of aircraft. Included was a paper (Document 11) by Lockheed's Kelly Johnson that focused on high altitude aircraft such as the SR-71. In addition, Teledyne Ryan Aeronautical (Document 12) reported on a number of aspects of producing a low-observable vehicle. Another contractor, Boeing reviewed "features of airborne vehicle configurations that have a primary influence on the resulting radar signature."(Document 13). Based on testing results, the Boeing expert discussed the impact of features — including engine inlets, nose shape, body shape, exhaust nozzles, control surfaces, weapons, wing location, and fuselage shape — on radar cross section.

By June 1991, Air Force work on stealth had resulted in a number of projects that it summarized in a review of the technology that it had just conducted. A briefing book (Document 14) discussed fundamentals about stealth, its value, and the four different Air Force programs — the F-117, B-2, F-22, and Advanced Cruise Missile.

The first of those programs, and the unconventional shape of the aircraft produced, had its origins in a 1962 work (Document 10) by Russian theoretical physicist (and electric engineer) Pytor Ufimtsev — which did not spur the Russian air force to either classify the work or make use of it. The paper, *Method of Edge Waves in the Physical Theory of Diffraction*, when translated by the Air Force Foreign Technology Division in 1971 would consist of over 200 pages of mathematical analysis. A foreword explained that Ufimtsev studied the scattering characteristics of "reflecting bodies with abrupt surface discontinuities or with sharp edges." He took into account "the laws of geometric optics …, the additional currents arising in the vicinity of the edges or borders which have the character of edge waves and rapidly attenuate with increasing distance from the edge or border."

Ben Rich, Kelly Johnson's successor as head of the Lockheed Skunk Works, would report in his memoirs that one afternoon a "Skunk Works mathematician and radar specialist named Denys Overholser … presented me with the Rosetta Stone breakthrough for stealth technology." Overholser had found the breakthrough in Ufimtsev's paper and explained that the Ufimtsev had demonstrated "how to accurately calculate radar cross sections across the surface of the wing and at the edge of the wing and put together these two calculations for an accurate total."[10]

From HAVE BLUE to the F-117


F-117. Photo credit: National Museum of the United States Air Force.

A first step in trying to convert Ufimtsev's theoretical results into an operational stealth aircraft was an Advanced Research Projects Agency (ARPA) project, began in the early 1970s. Designated HAVE BLUE, it resulted in two experimental aircraft, with a first flight in April 1977. The Air Force launched a program, designated SENIOR TREND, to build the F-117 in November 1978; it eventually produced 59 aircraft. A first flight, presumably at Area 51, took place in June 1981, and the Air Force declared the F-117 operational in October 1983 with Tonopah Test Range as its new home. Ten years later, in November 1988, the government confirmed the existence of the plane, revealed its designation, and released a picture of the aircraft.[11] In the two years before declassification the program experienced two crashes (Document 15, Document 16) that took the lives of the pilots.

Once it was declared operational, the F-117 was available for use in combat operations. The Air Force nearly used it in the 1986 attacks on Libya, ordered by President Reagan in response to Libyan involvement in the La Belle Disco bombing in West Berlin, but ultimately did not because of Defense Secretary Caspar Weinberger's reluctance to reveal the plane's existence. [12] First combat use would come three years later — in Operation Just Cause (Document 19, Document 22) — the operation to unseat and seize Panamanian strongman Manuel Noriega.

But the major use of the F-117 in combat activity took place in operations targeting sites in Iraq, beginning with Operation DESERT STORM. These operations were the subject of an official chronology (Document 17), an Army War College essay (Document 18) and the official history of the 37 th Fighter Wing (Document 19). The General Accounting Office (GAO) conducted a critical examination of the stealth fighter's effectiveness (Document 23) as part of its evaluation of the air war. The GAO found that the F-117 bomb hit range was "highly effective" — varying between 41 and 60 percent — but it did not reach the 80 percent claimed by the Defense Department.

Other histories of the F-117 wing (which had become the 49th Wing by 1996) included accounts of its participation in a variety of exercises as well as its use for coercive diplomacy. According to one history (Document 26) F-117s were deployed to Southwest Asia twice between July 1 and December 31, 1998 for Operations DESERT THUNDER and DESERT FOX. Both were ordered in response to Iraqi non-compliance with U.N. Security Council resolutions, but did not result in combat operations. In 1999, F-117s did go into combat — in

the Balkans — a subject that was discussed in the January – June 1999 history (Document 27) of the 49th Fighter Wing. Much of the treatment is redacted from the released version, although the declassified version reports that after the first round of strikes on March 24, 1999, General William Lake told his commanders "everyone is back safely. So far the score is F-117s 10, Yugoslav's 0."[13]

Deployments to South Korea and Southwest Asia, including use during the Iraq War, as well exercises, are covered in histories (Document 34, Document 37) for 2003 and 2004. The 2003 history (Document 34) and a history — *Black Sheep Over Iraq* (Document 36) — focus solely on F-117 operations in Operation Iraqi Freedom. The *Black Sheep* history covers orders to deploy for combat, the attempted decapitation strike intended to kill Saddam Hussein, subsequent combat missions, and an assessment of F-117 performance in the war.

The Soviets and Stealth

The Soviet military may not have initially embraced Ufimtsev's work, but it was inevitable, because of both internal and external influences, that they would eventually explore its use for their own aerial programs and for counteracting U.S. stealth aircraft. During the 1980s, if not before, the Intelligence Community and CIA closely reviewed those issues.

In January 1983 former DPD executive officer John McMahon (Document 3), then the Deputy Director for Central Intelligence, informed the director of the Intelligence Community Staff (Document 38) that he had asked the Deputy Director of Intelligence for an assessment of Soviet stealth technology.

A little over a year later, the Directorate of Intelligence produced a study (Document 40) entitled*Soviet Work on Cross Section Reduction Applicable to a Future Stealth Program*. The assessment examined Soviet radar cross section technology and a variety of potential applications to submarines, reentry vehicles, aircraft, spacecraft, cruise missiles, and ground vehicles.[14] Among its key judgments was that "the Soviets did not have a Stealth program in the 1970s" but that "because of the high US interest in this area, the Soviets probably began intensified research effort in the early 1980s, which may have led to a developmental program now under way."[15]

The same month that the CIA produced that assessment the Agency's continued interest in further work on Soviet stealth efforts was indicated by a memo (Document 42) from Julian C. Nail, the National Intelligence Officer for Science and Technology, to Director of Central Intelligence William J. Casey. Nail observed that the topic was on the agenda for a National Foreign Intelligence Board meeting in early March 1983, memos were being prepared for Casey to send to each principal indicating the importance he attached to the subject, and that the Office of Scientific and Weapons Research was seeking to enhance its analysis of the subject, mainly by getting additional clearances so the CIA analysts could learn about U.S. research and development efforts.

How the Soviets might react to U.S. stealth programs was the subject, in August 1985, of a special national intelligence estimate (Document 43) — *Soviet Reactions to Stealth*. Two key sections of the estimate focused on the counter-stealth potential of current and near-term Soviet systems (including early warning radar, fighter aircraft, surface-to-air missile, antiaircraft artillery, and command, control, and communications systems) and future Soviet technical responses. Another section examined prospective Soviet stealth developments —

including the process of incorporating stealth vehicles in Soviet military planning and the acquisition and use of stealth technology.

One indication that the Air Force may have limited the knowledge and the ability of U.S. intelligence analysts to use classified data on U.S. stealth research and development efforts was a figure labeled “Design Considerations for Stealth Aircraft” (p.8). Despite the figure’s Top Secret classification, it was, as acknowledged in a credit line adjacent to the figure, lifted from an issue of*Aviation Week & Space Technology*. Moreover, that figure was based on speculation what , at the time, the rumored stealth fighter might look like — speculation that proved to be considerably wide of the mark.

CIA Support to US Stealth Programs

In addition to assessing Soviet stealth programs, the CIA and other elements of the Intelligence Community provided U.S. stealth efforts with intelligence on Soviet forces and capabilities that was relevant to developing U.S. stealth vehicles and plans for their use. Thus, in a February 1, 1984 memo (Document 45) the director of the CIA Office of Scientific and Weapons Research (OSRW) reported that intelligence support for the U.S. stealth program included an analysis on “the Soviet threat to an Air Force Tactical Air Command Program in November 1983.”

A month later the OSWR director reported the number of new clearances (25) that were necessary to implement the stealth analytical effort (Document 47) Beyond the total clearances needed, the director indicated the offices involved and the specific topics to be examined. Thus, air defense and aircraft systems specialists at OSWR would work on stealth penetration analysis studies, specialists in the Office of Soviet Analysis would conduct strategic studies related to the implications of stealth capabilities, and other specialists in OSWR would examine Soviet weapons and technology.

MiGs at Area 51

Besides secret U.S. aircraft work, Area 51 also hosted the study of secretly acquired Soviet MiG fighters. The first effort involved a MiG-21, designated “Fishbed-E” by NATO. Israel acquired the plane in August 1966 when a captain in the Iraqi air force defected, landing the MiG at an airbase in northern Israel — an action that been arranged in advance by the Mossad, Israel’s secret intelligence service. From January 23, 1968 to April 8, 1968 the plane was loaned to the U.S. Air Force.[16]

The MiG, in the Air Force’s temporary possession, received a new designation — the YF-110 — and Area 51 became its new home. The exploitation effort, conducted by the specialists from the Air Force Foreign Technology Division (today known as the National Air and Space Intelligence Center) was designated HAVE DOUGHNUT. One report focused on technical characteristics of the plane, while another was a tactical evaluation. The latter (Document 50) had four primary objectives: (1) evaluating of the effectiveness of existing of existing tactical maneuvers by the Air Force and Navy combat aircraft and associated weapons against the MiG-21, (2) exploiting the tactical capabilities and limitations of the MiG-21 in air-to-air combat, (3) optimizing existing tactics and develop new tactics to defeat the MiG-21, and (4) evaluating the design, performance, and characteristics of the MiG-21. The exploitation reports spelled out the findings (includingDocument 50) with historical retrospectives about the effort prepared later (Document 48,Document 49).

Two other late 1960s exploitation efforts at Area 51 — both focused on evaluating the MiG-17 — were designated HAVE DRILL and HAVE FERRY. The HAVE DRILL MiG-17 began flying at Groom Lake on February 17, 1969 and flew 172 sorties over 55 days. The HAVE FERRY aircraft, which served as backup to the HAVE DRILL aircraft, began flying on April 9, 1969 and flew 52 sorties over 20 days.[17] As with the HAVE DOUGHNUT effort it resulted in a technical report and a tactical report (April 1970). The results were also the subject of two more recent briefings by (Document 51 and Document 52) by NASIC representatives.

While the HAVE DOUGHNUT and HAVE DRILL/HAVE FERRY efforts are the ones whose details have been declassified, they were not the last of MiG exploitation efforts at Area 51. Under a program designated CONSTANT PEG, the Air Force tested other MiGs — acquired by a variety of means — to determine their capabilities and vulnerabilities. In the 1970s the effort moved to Tonopah Test Range, about 70 miles northwest of Area 51.[18]

Radar Tests & Other Aircraft

Other aspects of Area 51 activities included tests of covertly acquired Soviet-radar systems. In November 1970, a project designated HAVE GLIB, referred to in a 1976 memo (Document 6), began. According to one account "a complex of actual Soviet systems and replicas" grew around Slater Lake, a mile northwest of the main base. The Air Force gave the systems such names as Mary, Kay, Susan, and Kathy and arranged them to "simulate a Soviet-style air defense complex."[19]

Subsequent to the declassification of the F-117 program, the Air Force managed two other aircraft programs at Area 51, but neither led to the production of operational fleet. Both have been partly declassified, with only some photos and fact sheets providing a few details about these secret programs.

One plane, developed by Northrop along with the Air Force and DARPA, was the TACIT BLUE battlefield surveillance plane (Document 56, Document 58) also known as the "Whale." Work began in 1978 and it first flew at Area 51 in February 1982, with the program concluding in 1985 — by which time it had been flown 135 times. The Air Force fact sheet (Document 58) reports that the objective was to "demonstrate that curved surfaces on an aircraft result in a low radar return signal" and states that TACIT BLUE "demonstrated that such an aircraft could operate close to the battlefield forward line without fear of being discovered by enemy radar."[20]

The other, a plane built by the McDonnell-Douglas "Phantom Works" was known as the BIRD OF PREY, after its resemblance to the Klingon spacecraft from *Star Trek*. The Air Force declassified its existence in 2002, because, according to the fact sheet (Document 59), "its design techniques had become standard practice." The fact sheet described the plane as a single-seat stealth technology demonstrator used to test stealth techniques and "new methods of aircraft design and construction." The project, which ran from 1992 to 1999, with the first flight in 1996, included 38 flights altogether.[21]

Two additional projects that may have been connected to Area 51 were associated with the May 2, 2011 raid that resulted in the death of Osama Bin Laden. One was the stealth helicopter that carried the Navy SEALs to the Abbottabad compound. The other was the RQ-170 stealth drone that had been used to monitor developments at the compound.[22] A

very brief fact sheet (Document 60) describes the RQ-170 as “a low observable unmanned aircraft system” intended to provide “reconnaissance and surveillance in support of the joint forces commander.”

THE DOCUMENTS

AREA 51

Document 1: Letter, Lyman Kirpatrick to Richard Bissell, October 13, 1961. Secret.

Source: CIA Records Search Tool (CREST), National Archives and Records Administration, College Park, Maryland.

This letter from the CIA’s Inspector General to the Deputy Director for Plans reports on his visit to the Development Projects Division (responsible for the U-2 and OXCART programs) “Area” — that is, Area 51. The topics covered include security arrangements (which Kirkpatrick considered inadequate), on-site management, and the survivability of the “program’s hardware when and if employed in actual operations.”

Document 2: [Deleted], Assistant to the DD/P, Memorandum for: AC/DPD, Subject: Inspector General’s Memorandum on His Trip to the Area, October 17, 1961. Secret.

Source: CREST.

This memo reports on Bissell’s “off-the-cuff” reactions to Kirpatrick’s letter (Document 1). While he embraced Kirpatrick’s comments on security, he had no strong reaction to his comments concerning on-site management, and questioned the proprietary of an inspector general commenting on the issue of OXCART vulnerability.

Document 3: John N. McMahon, Executive Officer, DPD, Memorandum for: Acting Chief, DPD, Subject: Aerial Observation of Area 51, April 6, 1962. Secret.

Source: National Reconnaissance Office (NRO) Release.

This memo from the DPD’s executive officer to its acting chief discusses the possibility of having Area 51 photographed by either a U-2 or CORONA spy satellite — as a means of estimating what the Soviet Union might learn from its own overhead images of the facility.

Document 4: Robert D. Singel, Memorandum for Chairman, COMIREX, Subject: [Deleted] SKYLAB Photograph, April 11, 1974. Top Secret.

Source: National Reconnaissance Office

This memo from the deputy director of the NRO to the chairman of the Director of Central Intelligence’s Committee on Imagery Requirements and Exploitation is the result of a photograph taken by SKYLAB astronauts of Area 51. It discusses some of the issues to be considered in deciding whether to release the photograph.

Document 5: [Deleted], Memorandum for: The Director of Central Intelligence, Subject: SKYLAB Imagery [Deleted], April 19, 1974. Confidential.

Source: CREST.

This memo to DCI William Colby, notes that the SKYLAB photograph of Area 51 was acquired inadvertently and that instructions had been issued not to photograph the facility. It also reports that the photo is the subject of an interagency review and that there was widespread opposition to its release.

Document 6: E.H. Knoche, Deputy Director of Central Intelligence, to General David C. Jones, Chief of Staff, United States Air Force, August 26, 1976. Secret.

Source: National Archives and Records Administration.

This letter discusses whether the CIA should continue to be responsible for the management of Area 51 or if the Air Force should assume responsibility. It identifies HAVE GLIB — the evaluation of foreign radar and threat systems — as the largest Defense Department project at the site at that time.

Document 7: United States Air Force, Det 3 SP, n.d. Unclassified/For Official Use Only.

Source: Editor's Collection.

This document is widely reported to be a manual for Detachment 3 of the Air Force Security Police, responsible for security at Area 51. It specifies the cover story to be employed by members of the security force to explain their activities.

Document 8: William J. Clinton, Letter to Congressional Leaders on Presidential Determination 95-45, January 30, 1996. Unclassified.

Source: www.gpo.gov.

This letter from President Clinton, notes that his determination exempted the Air Force's operating location "near Groom Lake, Nevada from any Federal, State, interstate, or local hazardous or solid waste laws that might require the disclosure of classified information concerning that operating location to unauthorized persons."

Document 9: George W. Bush, Memorandum for the Administrator of the Environmental Protection Agency, Presidential Determination No. 2003-39, Subject: Classified Information Concerning the Air Force's Operating Location Near Groom Lake, Nevada, September 16, 2003. Unclassified.

Source: www.whitehouse.gov

This memorandum reaffirms President Clinton's 1995 presidential determination (Document 8).

STEALTH FUNDAMENTALS

Document 10a, 10b, 10c: P. Ya. Ufimtsev, *Methods of Edge Waves in the Physical Theory of Diffraction*, 1971. Unclassified.

Source: Air Force Freedom of Information Act Release

Ufimtsev's 1962 work, translated by the Air Force Foreign Technology Division (today, the

National Air and Space Intelligence Center), provides the fundamental theoretical/mathematical basis for the F-117.

Document 11: Clarence L. "Kelly" Johnson, Lockheed Aircraft Corporation, "Reduction of Radar Cross Section of Large High Altitude Aircraft," n.d. (but circa 1975). Classification Not Available.

Source: Air Force Freedom of Information Act Release.

Most of this paper, written by the first head of the Lockheed Skunk Works, who supervised development of the U-2 and A-12 (OXCART), consists of figures related to the brief discussion of the relationship between stealth and aircraft shape.

Document 12: R. W. Lorber, R. W. Wintersdorff, and G.R. Cota, AFAL-TR-74-320, Teledyne Ryan Aeronautical, *Low-RCS Vehicle Study*, January 31, 1974. Secret.

Source: Air Force Freedom of Information Act Release.

This report describes the research performed by Teledyne Ryan under an Air Force contract on low-radar cross section aerial vehicles as well as some of the results obtained.

Document 13: John D. Kelly, Boeing Aerospace Company, "Configuration Design for Low RCS," September 1, 1975. Secret.

Source: Air Force Freedom of Information Act Release.

This paper discusses the impact on the radar cross section of aircraft of the design of different regions of the vehicle — including the nose, tail, broadside — as well as the impact of skin material. It also discusses the design a low RCS missile.

Document 14: Department of the Air Force, *Air Force Stealth Technology Review, 10-14 June 1991*, n.d.

Source: www.dod.mil/pubs/foi/Science_and_Technology/Other/263.pdf.

This briefing book consists of five tabs, which concern the value and evolution of stealth, the F-117, the B-2, the F-22, and the advanced cruise missile.

F-117 OPERATIONS

Document 15: Major General Peter T. Kemp, Commander, USAF Tactical Fighter Warfare Center, to TFWC/JA, Subject: Aircraft Accident – F-117, 81-0792, July 11, 1986, January 14, 1987. Secret/Special Access Required. Secret w/att: Report of Investigation (Extract).

Source: Air Force Freedom of Information Act Release.

This extract provides a statement of facts concerning the fatal crash of a F-117A aircraft on July 11, 1986. It covers, *inter alia*, crew qualifications, the history of the flight, the mission, the briefing and preflight, the flight, impact, rescue, and crash response.

Document 16: Lt. Col. John T. Manclark, 57 FWW/AT, Nellis AFB, N, *AFR 110-14 USAFAircraft Accident Investigation Board, 14 October 1987 – Tonopah Test Range* , December 8, 1987. Secret/Special Access Required.

Source: Air Force Freedom of Information Act Release.

This extract is a summary of facts concerning the October 14, 1987 crash of a F-117A that claimed the life of its pilot. As with the report of the on the July 1986 crash (Document 15), it covers —*inter alia* — crew qualifications, the history of the flight, the mission, the briefing and preflight, the flight, impact, rescue, and crash response.

Document 17: Harold P. Myers, Office of History, 37th Fighter Wing, Twelfth Air Force, Tactical Air Command, *Nighthawks over Iraq: A Chronology of the F-117A Stealth Fighter in Operations Desert Shield and Desert Storm*, January 9, 1992. Unclassified.

Source: Editor's Collection.

A two-page introduction is followed by a 32-page chronology of F-117A information related to operations Desert Shield and Desert Storm, from August 17, 1990 to February 28, 1991. The information include concerns personnel, deployments, administrative matters, exercises, and operations (pp. 8-36).

Document 18: Arthur P. Weyermuller, *Stealth Employment in the Tactical Air Force (TAF) – A Primer on Its Doctrine and Operational Use* (Carlisle Barracks, Pa.: U.S. Army War College, 1992). Unclassified.

Source: www.dtic.mil

This study focuses on the history of stealth development, the roles and missions of the F-117A and its performance during Desert Storm, and an assessment of how stealth technology fits into Air Force aerospace doctrine. It also discusses next generation stealth aircraft, specifically the F-22 fighter and B-2 bomber.

Document 19: Vincent C. Breslin, 37th Fighter Wing, *History of the 37th Fighter Wing, 5 October 1989 – 31 December 1991, Volume 1 – Narrative*, May 22, 1992. Secret.

Source: Air Combat Command Freedom of Information Act Release.

In addition to a chronology of events, this history includes a discussion of the creation of the 37thFighter Wing (established to replace the covert group established to oversee development of the F-117A while it was still a classified program), the "quest for normalization," F-117 operations in Panama (Operation Just Cause) and Iraq (Operations Desert Shield and Desert Storm), and events from the end of Desert Storm to the end of 1991.

Document 20a, 20b: Vincent C. Breslin, 37th Fighter Wing, *History of the 37th Fighter Wing, 1 January – 8 July 1992, Closeout, Volume 1 – Narrative*, August 11, 1992. Classification Not Available.

Source: Air Combat Command Freedom of Information Act Release.

The 37th Fighter Wing (Document 19) at Tonopah Test Range was inactivated on July 8, 1992, with F-117A fighters being transferred to a new unit, based at Holloman Air Force Base, New Mexico. This history contains a discussion of the inactivation, fully redacted

sections on mission revision and an operational readiness exercise – as well as treatments of the the employment of the F-117A in airshows, transfer of aircraft to Holloman, and a number of other topics.

Document 21a: Office of Public Affairs, Department of the Air Force, Fact Sheet 93-11, *F-117A Stealth Fighter*, November 1993. Unclassified.

Document 21b: Department of the Air Force, Fact Sheet, *F-117 A Nighthawk*, October 2005. Unclassified.

Sources: Air Force Office of Public Affairs, www.af.mil

These fact sheets, issued twelve years apart, describe the mission, features, background, and general characteristics of the F-117A. The second fact sheet contains details of the plane's employment in Desert Storm, the Balkans, and Operation Iraqi Freedom.

Document 22: Ronald H. Cole, Joint History Office, Office of the Chairman of the Joint Chiefs of Staff, *Operation Just Cause: The Planning and Execution of Joint Operations in Panama, February 1998 – January 1990*, 1995. Unclassified.

Source: www.dtic.mil.

The focus of this history is the involvement of the Chairman of the Joint Chiefs and the Joint Staff in the planning and direction of combat operations in Panama. Part of the history discusses the decision to use the F-117A as part of the operation — its first operational use — and its employment.

Document 23: General Accounting Office, GAO/NSIAD-97-134, *Operation Desert Storm: Evaluation of the Air Campaign*, June 1997. Unclassified.

Source: General Accounting Office.

This study focuses on the use and performance of aircraft and other munitions in Desert Storm, including the F-117, the validity of Defense Department claims about weapon systems' performance (particularly systems using advanced technology), the relationship between weapon system cost and performance, and the extent to which Desert Storm air campaign objectives were satisfied. Among its findings was that while F-117 bomb hit range varied between 41 and 60 percent, which the report characterized as "highly effective," the range was less than the 80-percent rate report after the war by the Defense Department.

Document 24: Gregg S. Henneman and David Libby, 49th Fighter Wing, *History of the 49th Fighter Wing, 1 July 1996 – 31 December 1997, Narrative, Volume No. 1*, May 28, 1998. Secret.

Source: Air Combat Command Freedom of Information Act Release.

With the inactivation of the 37th Fighter Wing (Document 20) and transfer of the F-117A fleet to Holloman AFB, they were assigned to the 49th Fighter Wing. This history focuses on mission and organization, operations and training (including operations against Iraqi targets, and partcipation in the Red Flag 97-1 exercise), and aircraft upgrades.

Document 25: Gregory S. Henneman, 49th Fighter Wing, *History of the 49th Fighter Wing, 1 January – 30 June 1998, Narrative, Volume No. 1*, October 22, 1998. Secret.

Source: Air Combat Command Freedom of Information Act Release.

As with the history for the preceding eighteen months (Document 24) the main focus of this history is mission and organization and operations and training. In addition to its discussion of F-117A deployment to Southwest Asia in response to developments in Iraq the history also discusses several exercises — Spirit Hawk '98 (described as "the Air Force's first ever low observable combat exercise"), Combat Hammer 98-04 (a weapons system evaluation program exercise) — as well as deployment in support of Fighter Weapons Instructor Course.

Document 26: Gregory S. Henneman, 49th Fighter Wing, *History of the 49th Fighter Wing, 1 July – 31 December 1998, Narrative, Volume No. 1*, May 19, 1999. Secret.

Source: Air Combat Command Freedom of Information Act Release.

This history discusses deployments to in support of operations in the Balkans and Southwest Asia. The two Southwest Asia deployments — Operation Desert Thunder and Operation Desert Fox — were in response to Iraqi non-compliance with U.N. Security Council resolutions and did not result in combat operations.

Document 27: William P. Alexander and Gregory S. Henneman, 49th Fighter Wing, *History of the 49th Fighter Wing, 1 January – 30 June 1999, Narrative, Volume 1*, n.d. Secret.

Source: Air Combat Command Freedom of Information Act Release.

This history follows the standard format for 49th Fighter Wing histories — covering mission and organization, operations and training, and maintenance. The chapter on operations includes a discussion of the F-117A deployment to Europe and its use against Serbian targets.

Document 28: William P. Alexander and Gregory S. Henneman, 49th Fighter Wing, *History of the 49th Fighter Wing, 1 July – 31 December 1999, Narrative, Volume 1*, n.d. Secret.

Source: Air Combat Command Freedom of Information Act Release.

In addition to discussing the role of F-117A aircraft in two exercises — Spirit Hawk 99 at Mountain Home Air Base, Idaho and EFX at Nellis AFB, Nevada — the history also contains a discussion of upgrades to the F-117, including an upgrade to the infrared acquisition designation system that "would allow F-117 pilots to 'look' through clouds, greatly increasing the aircraft's capability."

Document 29: William P. Alexander and Tracey S. Anderson, 49th Fighter Wing, *History of the 49th Fighter Wing, 1 January – 30 June 2000, Narrative, Volume 1*, n.d. Secret.

Source: Air Combat Command Freedom of Information Act Release.

The primary deployment discussed in this history was a deployment to Nellis Air Force Base, to take part in a "firepower demonstration" called CAPSTONE. It involved two F-117As dropping GBU-10 bombs on specified targets.

Document 30: William P. Alexander, 49th Fighter Wing, *History of the 49th Fighter Wing, 1 July – 31 December 2000, Narrative, Volume 1*, n.d. Secret.

Source: Air Combat Command Freedom of Information Act Release.

The history's discussion of operations and training includes examination of two exercises that involved F-117A participation – RED FLAG 01-01 and CAPSTONE. The first is described as "the first low observable (LO) integrated RED FLAG exercise to be flown of Nellis AFB." The latter involved, as did the identically named exercise in the first half of the year (Document 29), F-117A's dropping two GBU-10 bombs on specified targets.

Document 31: William P. Alexander, 49th Fighter Wing, *History of the 49th Fighter Wing, 1 January – 30 June 2001, Narrative, Volume 1* , January 28, 2003. Secret.

Source: Air Combat Command Freedom of Information Act Release.

As with earlier 49th Fighter Wing histories, this one discusses mission and organization, operations and training, and miscellaneous activities (including maintenance). While there were no operational deployments, the history reports on the deployment of aircraft, equipment, and personnel to several bases around the United States as well as F-117A involvement in RED FLAG 01-02.

Document 32: *History of the 49th Fighter Wing, 1 July – 31 December 2001,* n.d., Secret.

Source: Air Combat Command Freedom of Information Act Release.

This history covers mission and organization and deployments of the 49th Fighter Wing.

Document 33: William P. Alexander and Terri J. Berling, *History of the 49th Fighter Wing, 1 January – 31 December 2002, Narrative, Volume 1*, n.d. Unclassified/For Official Use Only.

Source: Air Combat Command Freedom of Information Act Release.

Despite its classification this history is heavily redacted, but does discuss F-117A participation in a European theater exercise named Operation Coronet Nighthawk.

Document 34: William P. Alexander and Terri J. Berling, *History of the 49th Fighter Wing, 1 January – 31 December 2003, Narrative, Volume 1*, n.d.

Source: Air Combat Command Freedom of Information Act Release

Among the topics examined in this history are F-117A deployments to the Middle East (and subsequent participation in Operation Iraqi Freedom) and South Korea as well as F-117A participation the Foal Eagle (Korea) and Red Flag (Nellis Air Force Base) exercises.

Document 35: Department of the Air Force, Air Force Tactics, Techniques, and Procedures 3

-3.18, *Combat Aircraft Fundamentals, F-117*, October 19, 2004. Unclassified/For Official Use Only.

Source: Air Combat Command Freedom of Information Act Release

This manual is intended to provide "aircrew the information need to make the right decisions during any phase of a tactical mission." Its chapters cover mission preparation, formation, aircraft basics and instruments, air-to-surface elements of a mission, air refueling, low altitude operations, night and adverse weather operations, and night systems.

Document 36: Gregg Henneman, *Black Sheep Over Iraq: The 8th Fighter Squadron in Operation Iraqi Freedom*, November 2004. Secret.

Source: Air Combat Command Freedom of Information Act Release

This study explores the role of F-117A aircraft in the 2003 conflict with Iraq. In addition to an examination of the F-117A background, it examines the orders to deploy the F-117A for combat, the attempted decapitation strike, subsequent combat missions, maintenance, and assessment of F-117 performance, and redeployment.

Document 37: William P. Alexander and Terri J. Berling, *History of the 49th Fighter Wing, 1 January – 31 December 2004, Narrative, Volume 1*, n.d. Secret.

Source: Air Combat Command Freedom of Information Act Release

This history contains a chronology of 49th Fighter Wing activities, and chapters on mission and organization, operations — including an extensive discussion of F-117A deployment to South Korea and participation the Eagle Flag 2004/0B exercise — and mission capability for the F-117A and other aircraft.

THE SOVIETS AND STEALTH

Document 38: John N. McMahon, Memorandum for: Director, Intelligence Community Staff, Subject: Soviet Stealth Technology, January 10, 1983. Secret.

Source: CREST.

This brief memo from the Deputy Director of Central Intelligence notes that he had asked the Deputy Director for Intelligence (Robert Gates) to produce a paper on Soviet stealth technology.

Document 39: Lawrence K. Gershwin, Memorandum for: Director of Central Intelligence, Deputy Director of Central Intelligence, Subject: Briefing on Soviet Stealth Efforts, January 30, 1984. Secret.

Source: CREST.

This memo notes that the Chairman of the National Intelligence Council had asked the National Intelligence Officer for Strategic Programs, Lawrence K. Gershwin, to prepare, in conjunction with the Office of Scientific and Weapons Research (OSWR), a briefing for Senator Sam Nunn on Soviet stealth technology.

Document 40: Directorate of Intelligence, Central Intelligence Agency, SW 84-10015,*Soviet Work on Radar Cross Section Reduction Applicable to a Future Stealth Program*, February 1984. Secret.

Source: CREST.

This the two main sections of this assessment cover Soviet radar cross section technology (including the theoretical base, measurement capability, materials, and transfer of technology) and applications (to submarines, reentry vehicles, aircraft, spacecraft, cruise missiles, and ground vehicles). The key judgments section states that the authors "feel certain that the Soviets did not have a Stealth program in the 1970s" but that "the Soviets probably began an intensified research effort in the early 1980s which may have led to a developmental program now under way."

Document 41: Julian C. Nail, National Intelligence Officer for Science and Technology, Note for the Director, Subject: Soviet Low Observable (Stealth) Technology, February 23, 1984. Secret.

Source: CREST.

This note to the Director of Central Intelligence summarizes efforts under throughout the Intelligence Community to produce assessments and other products concerning Soviet stealth technology.

Document 42: Julian C. Nail, Memorandum for: Director of Central Intelligence, Deputy Director of Central Intelligence, Subject: Distribution of SNIE on The Soviet Reactions to Stealth, July 24, 1985. Secret

Source: CREST.

This memo concerns limiting the distribution of the a special national intelligence estimate on Soviet reactions to stealth. The author suggests that rather than distributing 50 copies the estimate should be disseminated to 37 offices/individuals.

Document 43: Director of Central Intelligence, SNIE 11-7/9-85/L, *Soviet Reactions to Stealth*, August 1985, Top Secret .

Source: CIA Electronic Reading Room.

This estimate is described as "an effort to assess at the national level the Soviet capability and intention to respond to the US [stealth] challenge." Topics covered in the discussion include the concept of stealth, the counter-stealth potential of current and near-term Soviet systems, future Soviet technical responses, ballistic missile defenses, other defense options, prospective Soviet stealth developments, research facilities, aerodynamic systems, ballistic missile systems, and intelligence gaps.

Document 44: Directorate of Intelligence, Central Intelligence Agency, *US Stealth Programs and Technology: Soviet Exploitation of the Western Press*, August 1, 1988. Secret.

Source: CIA Historical Review Program Release.

This paper examines the intersection of Soviet examination of Western press reports on U.S.

stealth efforts and indigenous Soviet work in the area.

CIA STEALTH EFFORTS

Document 45: [Deleted], Director of Scientific and Weapons Research, Memorandum for: Deputy Director for Intelligence, Subject: CIA's Stealth Efforts [Deleted], February 1, 1984, w/att: CIA Intelligence Support to US Stealth Programs, Secret/Noforn.

Source: CREST.

The attachment to the February 1, 1984 memo notes that the CIA's Office of Scientific and Weapons Research had been providing direct support to US stealth efforts since 1980 and provides specific examples. It also describes "several initiatives … to better support policy makers." The February 1 memo outlines that the author believes "we have done well, what we have not done, and recommendations for future support."

Document 46: William J. Casey, Memorandum for: Deputy Director for Intelligence, Subject: CIA's Stealth Efforts, February 2, 1984. Secret

Source: CREST.

This memo is DCI Casey's response to the February 1 and its attachment.

Document 47: [Deleted], Director of Scientific and Weapons Research, Memorandum for: Director of Central Intelligence, Deputy Director of Central Intelligence, Subject: Implementation of CIA's Stealth Analytical Effort, March 1, 1984.

Source: CREST.

This memo reports on the number of clearances necessary for the CIA to carry out the analytical program concerning stealth suggested by the Director of the Office of Scientific and Weapons Research. It indicates the both the national intelligence and CIA entities that would be involved as well as the specific topics to be investigated.

EXPLOITATION

Document 48: Thomas R. Woodford, National Air and Space Intelligence Center, *HAVE DOUGHNUT Tactical Evaluation*, n.d. Unclassified.

Source: www.dreamlandresort.com/black_projects, permission of T.D. Barnes

This briefing reports on the 1968 tactical evaluation effort designated HAVE DOUGHNUT – which focused on a MiG-21 aircraft provided to the U.S. by Israel. The purpose of the effort was to evaluate the effectiveness of Air Force and Navy tactical maneuvers against the MiG-21, optimize tactics and develop new ones needed to defeat MiG-21s, and evaluate the design, performance, and operation characteristics of the MiG-21.

Document 49: Rob Young, *Project HAVE DOUGHNUT – Exploitation of the MIG-21*, n.d. Unclassified.

www.dreamlandresort.com/black_projects, permission of T.D. Barnes

This briefing covers, *inter alia*, the background of the HAVE DOUGHNUT effort (Document

48,Document 50); data on sorties flown; lessons learned; the positive features, shortcomings, and unique design features of the MiG; and Air Force and Navy responses to the findings.

Document 50: Defense Intelligence Agency, FTD-CR-20-13-69-INT, Volume II, *Have Doughnut (U) Tactical*, August 1, 1969.

Source: www.scribd.com

This 310-page report, produced by the Air Force Foreign Technology Division, on behalf of DIA, presents the detailed results of the tactical evaluation, the MiG-21 obtained from Israel. The report focused on evaluating the effectiveness of existing tactical maneuvers by Air Force and Navy combat aircraft and associated weapons against the MiG-21. It also was intended to exploit tactical capabilities and limitations of the MiG-21 in aerial combat and help optimize existing tactics and develop new tactics to defeat the MiG-21.

Document 51: Thomas R. Woodford, *HAVE DRILL/HAVE FERRY Tactical Evaluation*, n.d., Unclassified.

Source: www.dreamlandresort.com/black_projects, permission of T.D. Barnes

This briefing on the 1969 exploitation of a MiG-17 provides weapon system highlights, key statements by Air Force and Navy officials – as well as the evaluation, general conclusions, and recommendations of the Tactical Air Command and Navy.

Document 52: Rob Young, National Air and Space Intelligence Center, *HAVE DRILL/HAVE FERRY – Exploitation of the Soviet MiG-17F*, n.d. Unclassified.

Source: www.dreamlandresort.com/black_projects, permission of T.D. Barnes

This briefing describes the specifics of the exploitation efforts, designated HAVE DRILL and HAVE FERRY, of two versions of the Soviet MiG-17F fighter plane. It specifies the versions of the plane in the possession of the Foreign Technology Division (now the National Air and Space Intelligence Center), U.S. test equipment, the testing effort, and lessons learned.

ODDS & ENDS

Document 53: Department of Defense Instruction S-5230.19, Subject: PROJECT HAVE NAME Security Classification Guide, July 2, 1979. Secret.

Source: Department of Defense Freedom of Information Act Release.

This heavily redacted instruction from 1979 may pertain to an aircraft or radar testing program (similar to HAVE GLIB, Document 6) at Groom Lake.

Document 54: “Stealth,” August 29, 1980. Top Secret.

Source: Record Group 59, PPS Records of Anthony Lake, 1977-1981, August 1980, National Archives and Records Administration.

This memo, found in the Anthony Lake’s State Department file for the 1977-1981 years, is an attempt at stealth humor.

Document 55: Walter D. Clark, Northrop Grumman Corporation, United States Patent, No. 7,108,230 B2, *Aircraft with Topside Only Spoilers*,

September 19, 2006. Unclassified.

Source: www.spacepatents.com/patented_inventions/pat7108230.pdf.

This patent is for a low-observable aircraft with improved roll control characteristics.

Document 56: *DARPA Technology Transition* (Arlington, Va.: Defense Advanced Research Project Agency, 1997), Unclassified.

Source: www.darpa.mil

These pages from this DARPA history cover the stealth fighter, TACIT BLUE (Document 53) and HAVE BLUE/F-117 programs.

Document 57: EAFB Instruction 31-17, *Security Procedures for Inadvertent Tracking and Sensor Acquisition of Low Observable and Sight Sensitive Programs*, November 14, 2005. Unclassified.

Source: Federation of American Scientists (www.fas.org).

This instruction from the commander of Edwards Air Force Base in California assigns agency responsibilities "during inadvertent or unauthorized tracking of sight-sensitive and low observable (LO) tests assets within the R-2508 complex located at Edwards." It also notes that "it is strictly forbidden to train tracking sensors … on any LO or sight sensitive assets."

Document 58: National Air Force Museum Fact Sheet, *Northrop Tacit Blue*, n.d. Unclassified.

Source: www.nationalmuseum.af.mil

This fact sheet provides basic details on the history of the TACIT BLUE surveillance aircraft (Document 51), that flew at Area 51, but was never put into production. It also provides data on the planes specifications and perofmance.

Document 59: U.S. Air Force, Fact Sheet, *Boeing Bird of Prey,* n.d. Unclassified.

Source: www.nationalmuseum.af.mil

This fact sheet provides a short history of the Bird of Prey aircraft developed by the McDonnell-Douglas Phantom Works (later acquired by Boeing). It provides information on the length of the program, its first flight, the number of flights, and the purpose of the program.

Document 60: U.S. Air Force, Fact Sheet, RQ-170 Sentinel, December 10, 2009. Unclassified.

Source: www.af.mil.

This very brief fact sheet acknowledged the existence and mission, of the RQ-170 drone – which had been spotted in use over Afghanistan and had been referred to as the "Beast of Kandahar."

Notes

[1] Among the non-fiction books on Area 51, are David Darlington, *Area 51 – The DreamlandChronicles: The Legend of America's Most Secret Military Base* (New York: Henry Holt, 1997); Phil Patton, *Dreamland: Travels Inside the Secret World of Roswell and Area 51* (New York: Villard, 1998); Annie Jacobsen, *Area 51: An Uncensored History of America's Top SecretMilitary Base* (Boston: Little, Brown, 2011). For a critical review of Jacobsen's book, see Robert S. Norris and Jeffrey T. Richelson, "Dreamland Fantasies," *Washington Decoded*(www.washingtondecoded.com), July 11, 2011. Also, see Peter W. Merlin, "It's No Secret – Area 51 was Never Classified," available at www.dreamlandresort.com/pete/no_secret.html.

[2] Gregory Pedlow and Donald E. Welzenbach, *The Central Intelligence Agency and OverheadReconnaissance: The U-2 and OXCART Programs, 1954-1974* (Washington, D.C.: Central Intelligence Agency, 1992), p. 56. The history is available at:www2.gwu.edu/~nsarchiv/NSAEBB/NSAEBB434, posted on August 15, 2013.

[3] Ibid.

[4] Ibid., p. 57.

[5] Ibid., p. 274.

[6] Ibid., pp. 274, 284. The OXCART, KEDLOCK, TAGBOARD, and SR-71 Programs will be the subject of a future electronic briefing book.

[7] For the SKYLAB incident see, Dwayne Day, "Astronauts and Area 51: The Skylab Incident," *The Space Review* (www.thespacereview.com), January 9, 2006.

[8] Trevor Paglen, *Blank Spots: The Dark Geography of the Pentagon's Secret World* (New York: Dutton, 2009), p. 41.

[9] Pedlow and Welzenbach, *The Central Intelligence Agency and Overhead Reconnaissance,* p. 129-130, 259.

[10] Ben R. Rich and Leo Janos, *Skunks Works: A Personal Memoir of My Years at Lockheed*(Boston: Little, Brown, 1994), pp. 19-20. Overholser was one of three authors of a patent (5,250, 950) filed on February 13, 1979 (which they assigned to Lockheed) for a low-observable aircraft.

[11] *Defense Advanced Research Projects Agency Technology Transition* (Arlington, Va.: DARPA, n.d., but circa 1998-2000), p. 66.

[12] Rich and Janos, *Skunk Works* , p. 96.

[13] Use in the Balkans resulted in the loss of one plane, which was turned over to Russia, although the pilot was recovered. See Darrell Whitcomb, "The Night They Saved Vega 31," *Air Force Magazine* , December 2006, pp. 70-74.

[14] The United States investigated the employment of stealth characteristics in satellites, ships, and missiles – specifically, the MISTY imagery satellite, the SEA SHADOW surface vessel, and the advance cruise missile. See, Jeffrey T. Richelson, "Satellite in the Shadows," *Bulletin of the Atomic Scientists,* May/June 2005; "Sea Shadow," www.lockheedmartin.com, accessed October 21, 2013;*Defense Advanced Research Projects Agency Technology Transition*, p. 115.

[15] Directorate of Intelligence, Central Intelligence Agency, *Soviet Work on Radar CrossSection Reduction Applicable to a Future Stealth Program* , February 1984, p. iii.

[16] Ian Black and Benny Morris, *Israel's Secret Wars: A History of Israel's Intelligence Services*, (New York: Grove, Weindenfeld, 1993), pp. 206-207; John Lowery, "Have Doughnut," *Air Force Magazine* , June 2010, pp. 64-67; T.D. Barnes, "Exploitation of Soviet MiGs at Area 51,"http://area51specialprojects.com/migs_area51.html, accessed November 20, 2010.

[17] Barnes, "Exploitation of Soviet MiGs at Area 51."

[18] "Air Force declassifies elite aggressor program," November 13, 2006, www.af.mil. For histories of the effort see: Gaillard R. Peck, Jr., *America's Secret MiG Squadron: The Red Eagles of CONSTANT PEG* (Long Island, N.Y. Osprey, 2012); Steve Davies, *Red Eagles:America's Secret MiGs* (Long Islands, N.Y.: Osprey, 2008).

[19] "Slater Lake," *Roadrunners Internationale Monthly House Six News and Gossip* , October 1, 2008, p. 8.

[20] For an account of the TACIT BLUE effort, see Peter Grier, "The (Tacit) Blue Whale," *Air Force Magazine* , August 1996.

[21] For an account of the BIRD OF PREY program, see Bill Sweetman, "Bird of Prey," *Popular Science* , January 2003, pp. 44-49.

[22] Sean D. Naylor, "Mission helo was secret stealth Black Hawk," www.armytimes.com, May 4, 2011.

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