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October 1956. This unit's timely and accurate information enabled the PARAMOUNT Committee to predict the joint Israeli-British-French attack on Egypt three days before it took place.

On 11 September, Detachment A pilot Jacob Kratt overflew the French Mediterranean naval base at Toulon. He brought back imagery revealing that France was loading troopships at Toulon. During the rest of the month, Detachment A pilots flew another eight missions over the Middle East. By this time, the new Detachment B in Turkey was ready for operations, and it was better positioned to provide coverage of the Middle East. Detachment B began flying missions in September and soon became the primary detachment for Middle East overflights, conducting nine out of the 10 such missions flown in October.⁴⁸

Detachment B's first U-2 flight, on 11 September 1956, made passes over Turkey, Cyprus, and Rhodes. The next flight, more than two weeks later, covered much the same ground but flew as far west as Malta, Sicily, and Crete. Both were "special" missions aimed at maintaining surveillance of the British and French fleets and forces as they prepared for the attack on Egypt. Meanwhile, Detachment A pilots flew four missions in the Western Mediterranean.

During this period, the PARAMOUNT Committee's photointerpreters developed the new science of "tent-ology"—counting the tents of British forces on the islands of Cyprus and Malta to determine the number of troops deployed. The photointerpreters used changes in the number of tents to determine that the British forces were beginning to move toward the beaches, where they were eventually lightered to offshore troopships.⁴⁹

Noting the U-2 activity in the Middle East, President Eisenhower wrote in his diary on 15 October 1956: "Our high-flying reconnaissance planes have shown that Israel has obtained some 60 of the French Mystere pursuit planes, when there had been reported the transfer of only 24."⁵⁰ Other U-2 photographs revealed the presence

⁴⁸ *OSA History*, chap. 19, annex 120. "CIA U-2 Missions Flown, 1956-1968." pp. 1-2 (FS Codeword).

⁴⁹ Lundahl and Brugioni interview (FS Codeword).

⁵⁰ Dwight D. Eisenhower Diary, 15 October 1956, DOEL.

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of British Canberra bombers at Akrotiri, Cyprus. The Anglo-French military buildup greatly irritated President Eisenhower, who considered these activities a violation of the 1950 Tripartite Declaration, in which the United States, the United Kingdom, and France had agreed to maintain the status quo in armaments and borders in the Middle East. To Arthur Lundahl he remarked, "It's a hell of a note when you have to G-2 your friends."⁴¹

U-2 photography continued to keep the President and other key officials well informed about the progress of the crisis. Flights over Israel and Rhodes on 21 October and Cyprus on 25 October revealed heavy military concentrations and an increase in the number of troop transports and air forces. On the basis of this information, Secretary of State John Foster Dulles told the President on 28 October that he believed an Israeli attack on Jordan was imminent, adding that he thought the British and French would take advantage of such an attack to occupy the Suez Canal.⁴²

The 10-day Middle East war began on the afternoon of 29 October 1956 with Israeli paratroop drops in the Sinai peninsula, followed by mobile columns striking deep into Egyptian territory. The next day, 30 October, Francis Gary Powers conducted mission 1314. He overflew Lebanon, Jordan, Israel, and finally the Sinai, where he photographed black puffs of smoke from the fighting between Israel and Egypt. Adana-based U-2s were in the air for the next two days filming the Suez Canal area and neighboring countries.⁴³

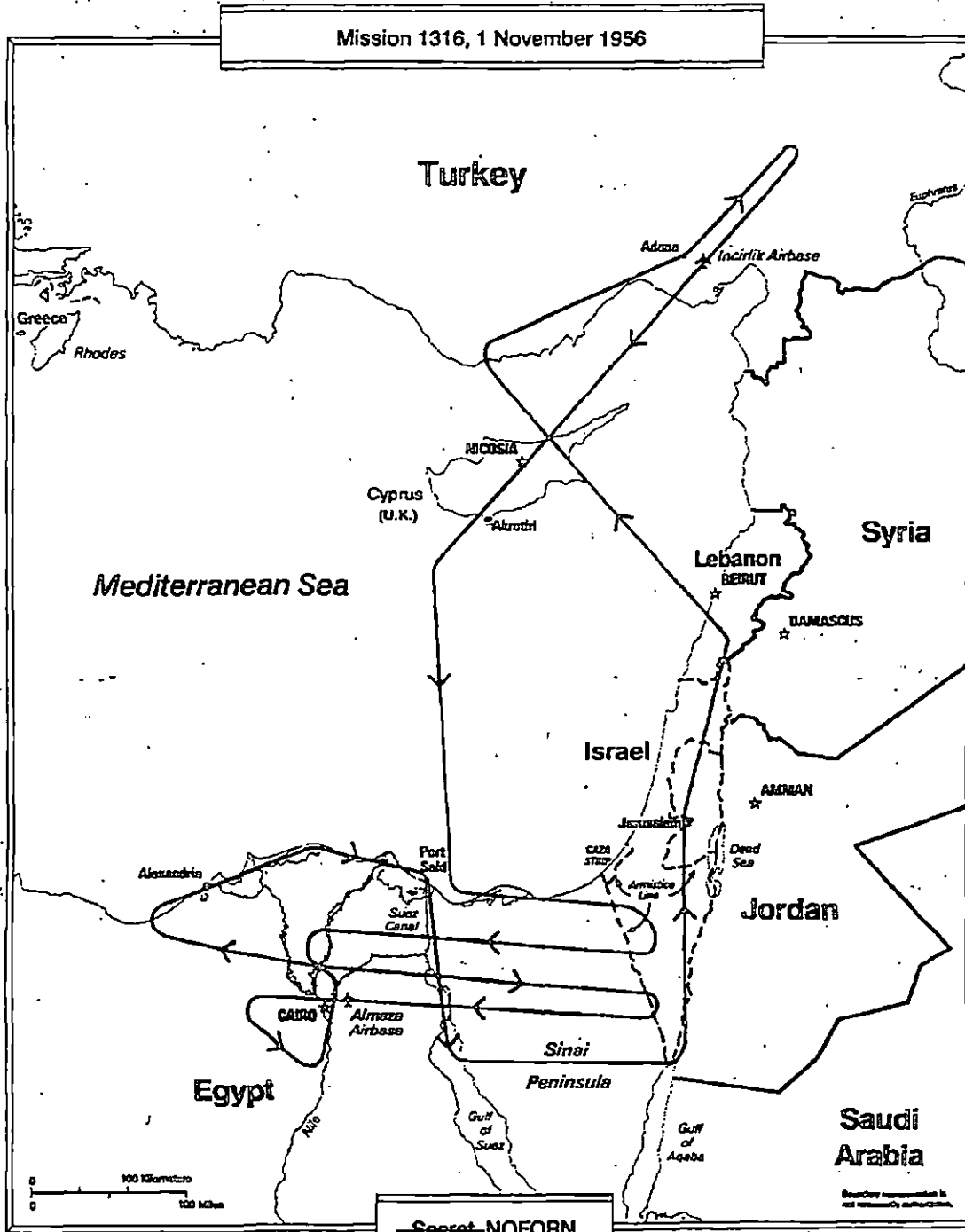
The United Kingdom and France entered the fray on the evening of 31 October with bombing raids against major Egyptian airfields. The Anglo-French bombing campaign continued for the next 48 hours. Early on the morning of 1 November, an Adana-based U-2, piloted by William Hall, took off to gather intelligence on the Anglo-French military activity. After photographing Cyprus, Hall flew south to the Sinai Desert, where he made several passes to obtain complete coverage of the Israeli-Egyptian fighting there. He then headed west to Cairo, passing directly over the main Egyptian airbase

⁴¹ Lundahl and Brugioni interview (FS-Codeword).

⁴² Telephone calls, 28 October 1956. DDE Diary, DDEL.

⁴³ Powers, *Operation Overflight*, pp. 308-309; Mission folder 1314 (30 October 1956). OSA records, job 67-8-972, box 1 (FS-Codeword).

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DETACHMENT B FLIGHTS FROM PAKISTAN

The most important series of overflights in the summer of 1957 were those that Detachment B staged to gather intelligence on the Soviet Union's guided missile and nuclear programs. President Eisenhower had approved these overflights at the meeting on 6 May 1957, provided that Pakistan allowed the U-2s to operate from its territory (the desired targets were too far away from the U-2 base in Turkey).

[redacted] Richard Bissell's personal assistant, and [redacted] met with President Iskander Mirza, Prime Minister Huseyn Shaheed Suhrawardy, and Army Commander Gen. Ayub Khan between 3 and 7 June 1957 and received permission to operate from Lahore. The airfield at Peshawar, a more desirable location, was not available because of repair work. Detachment B at Ankara ferried four of its U-2s, two of which were dirty birds, to Lahore. A C-124 brought in eight pilots and ground crews to prepare for missions over the Soviet Union and the People's Republic of China (PRC) beginning on 4 August (Operation SOFT TOUCH). During a 23-day period, these aircraft made nine flights: seven over the USSR and two over the PRC. Although one of the seven flights over the USSR was a failure because the camera malfunctioned after taking only 125 exposures, the remaining missions over Central Asia were a complete success, producing a bonanza of information that kept scores of photointerpreters busy for more than a year.⁴²

The 5 August flight, a dirty bird piloted by Buster Edens, was the first to photograph the major Soviet space launch facility east of the Aral Sea in Kazakhstan. None of the mission planners was certain just where the range was located, so the U-2 pilot followed the rail lines in the area. As a result, the plane did not pass directly over the rangehead and obtained only oblique photography.

Although known in the West today as Tyuratam, this missile installation had no name when it was first photographed in August 1957. In preparation for a briefing to President Eisenhower on the SOFT TOUCH photography, Dino Brugioni, an assistant to PID chief Arthur Luridahl, examined all the existing maps of the area to see if he could find a place name for the missile base. Only one map, made by the Germans during World War II, showed a community in the vicinity of the missile facility. The settlement's name was Tyuratam, which means "arrow burial ground" in the Kazakh language, and this

⁴² OSA History, chap. 12, pp. 19-20 (TS Codeword); NPIC History, vol. 1, pp. 159-161 (S).

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nuclear device. These photographs also revealed evidence of a recent, low-yield, above-ground nuclear test

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On its way to Semipalatinsk, the 21 August mission flew a search pattern over the western end of Lake Balkash looking for another Soviet missile-related installation and made the first photographs of what was later determined to be the new missile test center at Saryshagan. This facility was used to test radars against incoming missiles fired from Kapustin Yar, 1,400 miles to the west. Saryshagan later became the center for the development of the Soviet Union's advanced antiballistic missile (ABM) weapon system.

On 23 August 1957, DDCI Cabell, Richard Bissell, and Air Force Chief of Staff Twining met with President Eisenhower to report on the results of Operation SOFT TOUCH. They showed the President some of the photographic results of the earlier missions and reported on the effects of the antiradar measures. Although the antiradar measures had not proved successful, the photographic yield from the missions was extremely valuable. Bissell then informed the President that the SOFT TOUCH operation was just about to conclude with the transfer of the aircraft back to Adana. He asked permission for one of the U-2s to make another overflight of the Soviet Union on this return trip, but the President denied the request, not wishing to conduct any more overflights than were necessary.⁷⁷

THE DECLINE OF DETACHMENT A

During the summer of 1957, all overflights of the Soviet Union were conducted by either Detachment B or Detachment C. Detachment A in Germany was a less desirable starting point for overflights of the Soviet Union because such missions had to cross Eastern Europe first, increasing the likelihood of detection and diplomatic protests. Furthermore, the Soviet Union's air defense and radar networks were strongest along its western borders, so Detachment B missions over the southern portion of the Soviet Union and Detachment C missions

⁷⁷ Mission folder 4045 (20 August 1957) and 4050 (21 August 1957), OSA records, job 67-B-972, box 5 (TS Codeword).

⁷⁸ Andrew J. Goodpaster, Memorandum for the Record, 23 August 1957, WHOSS, Alpha, DDEL (PST).

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in the Far East were less risky than those conducted by Detachment A. Finally, the main target of U-2 photography after the bomber issue receded was Soviet missile and nuclear progress. The testing areas for these weapons were located in the vast open spaces of the south-central and eastern portions of the Soviet Union, which lay beyond the range of Detachment A's aircraft.

The decline in importance of Detachment A had begun with the President's standdown order of 10 July 1956. During the next three months, the detachment conducted only 11 missions, all over the Mediterranean region rather than the original target of the Soviet Union, and the slow pace of activity and change in mission adversely affected pilot morale. One of the detachment's aircraft was lost in a crash on 17 September, killing pilot Howard Carey and garnering unwanted publicity. Conditions improved when the detachment moved to the newly renovated facility at Giebelstadt in early October 1956, but security now became a problem there. Detachment A personnel discovered that a long, black Soviet-Bloc limousine was parked at the end of the Giebelstadt runway whenever the U-2s took off.³⁸

During the next year, Detachment A mounted only four overflights. The first two were over Eastern Europe: one over Bulgaria on 10 December 1956 and the other over Albania on 25 April 1957. Then a long period of inactivity followed, ending with a third mission on 11 October 1957, which conducted electronic surveillance of Soviet naval maneuvers in the Barents Sea. The final overflight of Detachment A, mission 2040 on 13 October 1957, flew north over Norway to the Bering Sea, turned southeast to overfly Murmansk, and then exited to the north, returning to Germany via Norway.³⁹

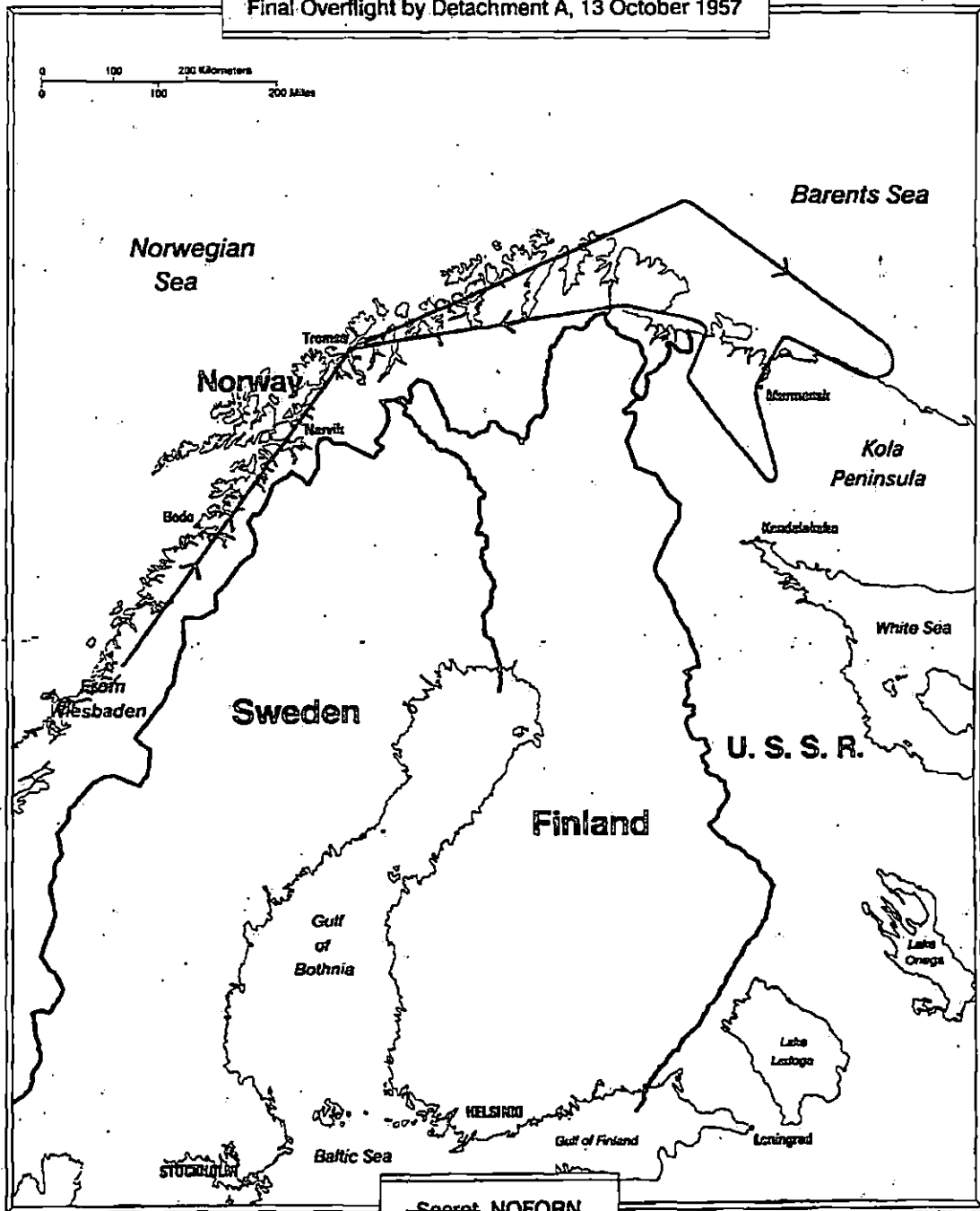
Although the final missions of Detachment A achieved excellent results, project headquarters had already decided that Western Europe was not a satisfactory location for overflights of the Soviet Union and had notified Detachment A on 20 September 1957 that its operations would cease in November. By 15 November 1957, all of the detachment's personnel and aircraft had returned to the United States. During Detachment A's 17-month period of operations, seven pilots

³⁸ *OSA History*, chap. 11, pp. 41-42 (FS Codeword).

³⁹ Mission folders 4018 (10 December 1956), 2036 (25 April 1957), 2037 (11 October 1957), 2040 (13 October 1957), OSA records, job 67-B-972, box 7, and job 67-B-328, box 6 (FS Codeword).

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Final Overflight by Detachment A, 13 October 1957



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had flown a total of 23 missions: six over the Soviet Union, five over Eastern Europe, and most of the remaining 12 missions over the Mediterranean area.⁹⁰

COOPERATION WITH NORWAY

The final missions of Detachment A had one unforeseen result: the beginning of cooperation between CIA and the Norwegian Intelligence Service on the U-2 program. Norwegian radars tracked the overflights of the Barents Sea and Murmansk in October 1957, and Col. Vilhelm Evang, Chief of the Norwegian Defense Staff Intelligence Service,

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[REDACTED] In March 1958, Colonel Evang came to Washington and received a briefing from Arthur Lundahl together with sanitized photos that did not reveal the altitude of the aircraft or the focal length of the camera. The Agency provided additional photos to Norway during a visit by a PID staff member in July.⁹¹

Later that year Norway agreed to provide an airfield for the United States to conduct U-2 flights that did not violate Soviet airspace. On 15 September 1958, a Detachment B staging party arrived at Bodo Air Force Base.

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[REDACTED] this was followed by an ELINT collection flight over international waters (the Kara Sea) on 25 October. On 6 November, the U-2 returned to Adana by conducting a lengthy ELINT collection flight along the borders of the Soviet Union and East Germany. During the initial portion of the mission, when the U-2 flew along the Soviet-Finnish border and then turned east over the Gulf of Finland to come within 60 miles of Leningrad (while remaining over international waters), the aircraft was the target of 23 unsuccessful Soviet intercept attempts.⁹²

⁹⁰ OSA History, chap. 11, p. 44; chap. 19, annex 120 (TS Codeword).

⁹¹ Ibid., chap. 11, pp. 44-45 (TS Codeword); NPIC History, vol. 3, pp. 447-8 (S).

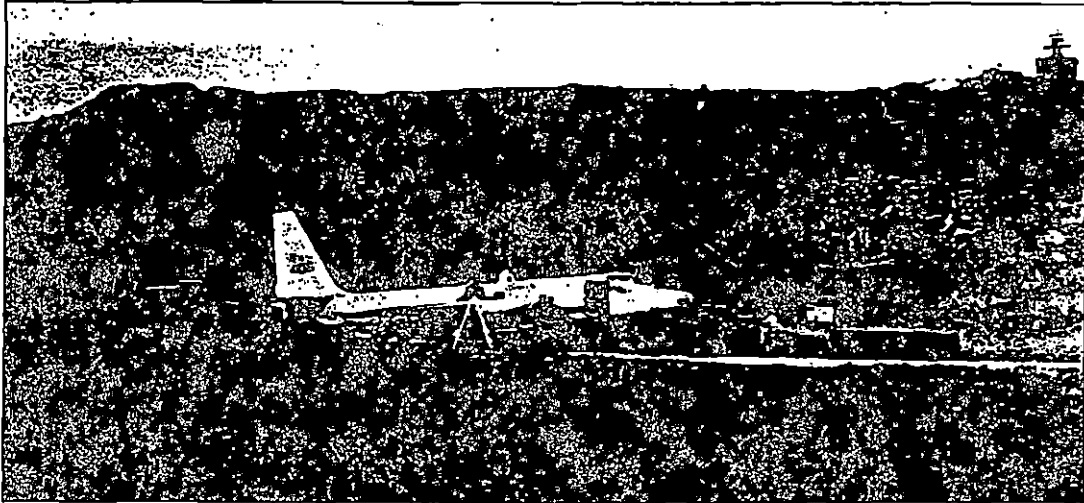
⁹² Mission folders 1482 (9 October 1958), 4092 (25 October 1958), and 4093 (6 November 1958), OSA records, job 67-B-972, boxes 3 and 10.

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DECLINING OVERFLIGHT ACTIVITY

U-2 at Bodo, Norway

Operation SOFT TOUCH (4-27 August 1957) proved to be the high water mark of U-2 operations against the Soviet Union. Detachment B staged one more overflight on 10 September 1957, when a U-2 piloted by William Hall flew from Adana to photograph the Kapustin Yar Missile Test Range for the first time since the RAF's overflight in 1953, obtaining photographs of a large medium-range ballistic missile (MRBM) on the launchpad. Six days later Detachment C conducted its successful overflight of the ICBM impact site at Klyuchi, and October saw the final two overflights of Detachment A. After these missions, penetration overflights became a rarity. There would be only six more during the next 32 months: one, in 1958; two, in 1959; and three, in 1960 (one of which was unsuccessful). During this period, President Eisenhower did authorize a number of flights along Soviet border areas that occasionally penetrated short distances inside the border, but the Chief Executive had become extremely wary of authorizing "deep penetration" overflights, which invariably brought protests from Moscow.

The border flights took place under tight controls. Beginning in the fall of 1957, all messages from Washington to Adana giving coordinates for flights along the Soviet border contained the statement: "This is not a penetration overflight" and warned about flying too close to Soviet borders. The Soviets even attempted to shoot down

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U-2s flying well within international airspace above the Black Sea, as was the case on 27 October 1957, when electronic intelligence equipment on a U-2 flight over the Black Sea that never violated Soviet airspace revealed 12 attempts at interception by Soviet fighters.⁹³

The sole U-2 overflight of 1958 was conducted by a dirty bird from Detachment C. On 1 March 1958, mission 6011 overflew the Soviet Far East and photographed the Trans-Siberian Railroad, Sovetskaya Gavan', the Tatar Strait, and a strange installation at Malaya Sazanka, which was eventually determined to be a structure for mating nuclear devices with their detonators. This was the first and only U-2 overflight of the Soviet Union staged from Japan.⁹⁴

On 5 March 1958, the Soviet Union delivered a vigorous protest concerning this mission, prompting President Eisenhower to tell Colonel Goodpaster on 7 March to inform the CIA that U-2 flights were to be "discontinued, effective at once."⁹⁵ This standdown was to last more than 16 months, until July 1959. The Soviets had not been fooled by the antiradar devices carried by mission 6011, as was demonstrated by the detailed information about the mission contained in a Soviet aide-memoire delivered on 21 April 1958. It was clear that dirty bird aircraft were not effective and that Soviet radar operators had little difficulty in tracking them. At this point, the Agency abandoned the use of the antiradar devices on the U-2. As a substitute, Lockheed began working to develop a paint with radar-suppressant qualities, but this project also proved unsuccessful.

The U-2s were not the only cause for the Soviet protests that so vexed the President. On 27 June 1958, an Agency C-118 on a courier flight from Adana to Teheran strayed into Soviet Armenia and was shot down; the Soviets captured two survivors, including one Agency employee. Ten days later the Air Force began launching balloons designed to fly across the Soviet Union and Eastern Europe. This new balloon project (known as WS-461L) had been authorized by President Eisenhower on 25 June after Deputy Secretary of Defense Donald Quarles argued that a small number of balloons should be

⁹³ Mission folder 4061 (27 October 1957), OSA records, job 67-B-972, box 8 (FS Codeword).

⁹⁴ Mission folder 6011 (1 March 1958), OSA records, job 67-B-972, box 13 (FS Codeword).

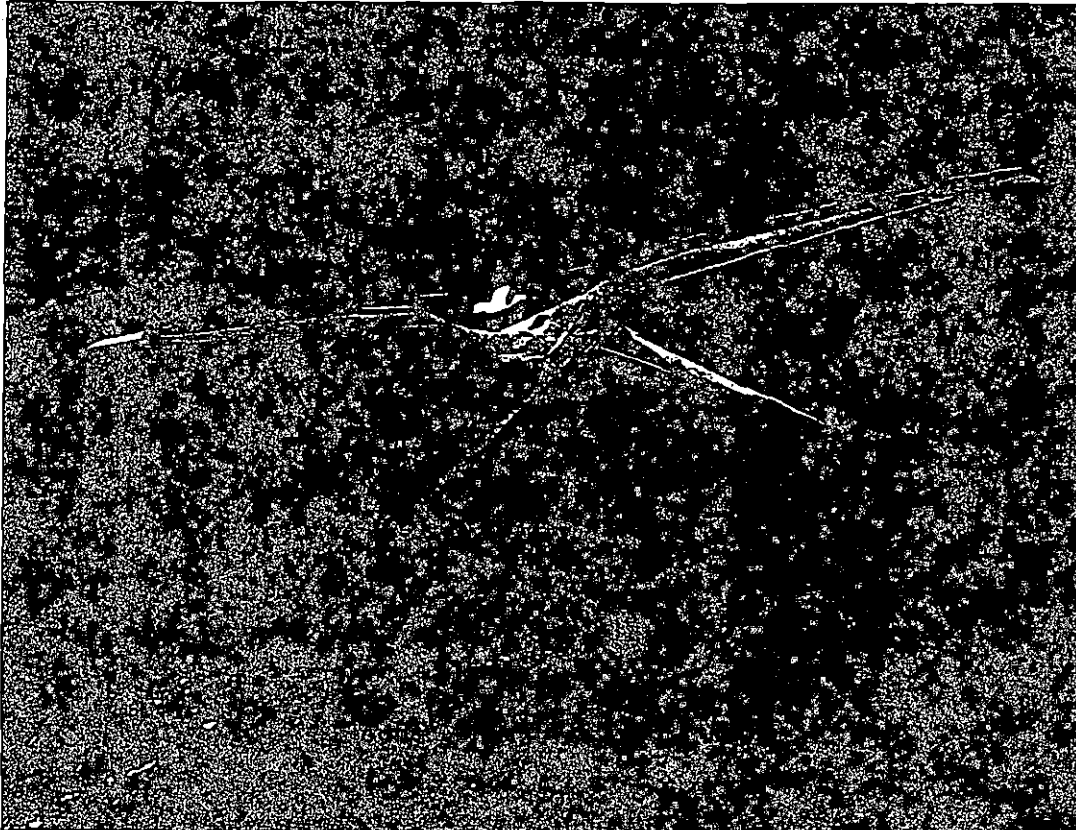
⁹⁵ Andrew J. Goodpaster, Memorandum for the Record, 7 March 1958, WHOSS, Alpha, DDEL (FS, declassified).

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Project AQUILINE

Corporation for chainsaws, the aircraft's designed speed was 60 knots at an altitude of 1,000 feet with a 15-pound payload. The aircraft could fly at this speed for up to 30 hours, thanks to the engine's extremely high fuel efficiency: 480 nautical miles per gallon of fuel.

In 1968 tests on an AQUILINE prototype at Randsburg Wash on the US Navy's Naval Ordnance Test Station at China Lake, California, showed that the aircraft was extremely difficult to see. To assist pilots of chase aircraft in keeping AQUILINE in sight, its entire upper surface was painted bright orange; even so, sighting remained difficult.

The testing process was very hard on AQUILINE because it was recovered by flying it into a net close to the ground, which almost always caused some damage to the wings or propeller. As a result, one

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or more of the aircraft was always being repaired, and eventually three of the five AQUILINE prototypes were destroyed in testing.

Although AQUILINE's visual and acoustic signatures were very small, its radar cross section continued to cause problems. The radar cross section at low frequencies was less than one-tenth of a square meter, giving it a radar signature smaller than that of an eagle, but there were flares in the VHF region that increased the likelihood of detection.

Studies indicated that the radar cross section problems could eventually be reduced to acceptable levels, but the greatest weakness of the AQUILINE project was its navigational system. AQUILINE did not have a programmable autopilot; it had to be flown by remote control from the ground. Once the aircraft flew over the horizon, all navigational commands had to be relayed to it by high-flying aircraft. A DC-6 loitering at 25,000 feet would give AQUILINE a range of 250 nautical miles; use of a U-2 at 70,000 feet could increase this to 350 nautical miles.

--Such a range was suitable for the targets originally conceived for AQUILINE,

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and the development time and costs for AQUILINE began to soar. By 1971 ORD had spent six years and \$33 million on AQUILINE but still had many important problems to resolve.

At this point the project was turned over to the Office of Special Activities for operational testing at Area 51 in Nevada. Flight tests showed the aircraft to be successful by the standards originally set for the project in 1967, as it flew 130 miles and obtained very high resolution photography of a target before returning successfully to the original launchsite. However, improving AQUILINE sufficiently to make it a practical long-range reconnaissance system was estimated to cost another \$35 million and take two to three years. On the recommendation of DDS&T Carl Duckett on 1 November 1971, Project AQUILINE was canceled. The project's aircraft and equipment were eventually transferred to the US Army for use in a battlefield management system known as AQUILA, which has yet to be deployed because of continuing developmental problems.

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Defense Research and Engineering, John Foster, liked the concept and provided DOD funding for ORD to develop two versions of AXILLARY, one with a radar-homer and one with a television reconnaissance package. The radar homing system proved successful as AXILLARY sought out and destroyed a radar during testing at China Lake Naval Air Station. However, the end of US involvement in Vietnam in early 1973 led to the cancellation of further DOD funding, and AXILLARY was placed on the shelf. Melpar, Inc., continued to work on the radar-homing version and eventually sold some AXILLARY-type aircraft to Israel, which used them to destroy Syrian radars in Lebanon in 1982.

PINE RIDGE

While work was still in progress on low-altitude, short-range reconnaissance systems like AQUILINE and AXILLARY, CIA scientists and engineers were also working on a high-altitude recoverable unmanned reconnaissance vehicle with an extremely-low-radar cross section that would enable it to fly undetected over hostile territory. During the 1960s there had been a study conducted by the Teledyne Ryan Aeronautical Company of San Diego on the construction of an undetectable drone known as SANDY HOOK. This 44-foot long drone would operate at 120,000 feet at Mach 0.9, with a range of 5,000 nautical miles. Its radar cross section would be 0.01 square meters. Project SANDY HOOK never advanced very far in development; projected high costs and substantial technical risks led to its cancellation in December 1969.

Some of the concepts in SANDY HOOK were carried over into a new project known as PINE RIDGE, which was a proposal for an unmanned reconnaissance vehicle with an even lower radar cross section (0.001 square meter). Research on SANDY HOOK had indicated that a radar cross section this low was attainable and would prevent detection and tracking by existing radar defense systems. The PINE RIDGE proposal called for a delta-shaped vehicle, approximately 17 feet long with a 21-foot wingspan. Two vertical stabilizers would give the vehicle an overall height of three to four feet. An existing Teledyne J-100-CA-100 Turbojet engine could have been used to power the vehicle at Mach 0.9 at the operating altitude of 65,000 to 75,000 feet. Range was estimated at 3,300 nautical miles.

Despite interest within the CIA and the Air Force for an undetectable reconnaissance vehicle, PINE RIDGE was never funded. In January 1971 high-level representatives from DOD and CIA rejected a proposal for a feasibility study to be conducted by Ryan Aircraft.

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The following year, the Director of the Office of Special Activities, Brig. Gen. Harold F. Knowles, wrote a memorandum to the DCI proposing that the CIA develop a clandestine low-radar-cross-section vehicle like PINE RIDGE, but this proposal also failed to attract support. With all the improvements in satellite reconnaissance that had taken place during the previous decade, neither CIA nor the Air Force was willing to invest substantial funding in a project to send aircraft, manned or unmanned, over the Soviet Union.

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