MILE STONES

Operation Igloo White

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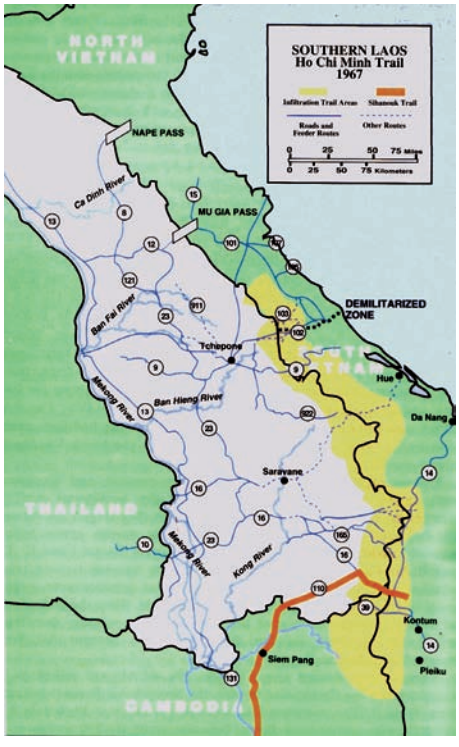
Operation Igloo White in Laos, which began in 1968, remains to this day almost as controversial as the Vietnam conflict itself. Igloo White was a bold plan to effectively 'instrument' the Ho Chi Minh Trail with remote sensor devices, which enabled US forces to 'listen out' on enemy movements in Laos. This, in turn, facilitated interdiction of North Vietnamese Army supply lines and staging areas used to resupply the military campaign conducted in South Vietnam.

Over the last few years much has been written about Igloo White, allowing a much better picture of this groundbreaking, albeit not entirely successful program.

The impetus for Igloo White was the limited military effect of the restricted, and politically driven, bombing of North Vietnam along with ongoing difficulties in targeting the Ho Chi Minh Trail.

The Communist leadership in Hanoi tolerated serious damage to their economy and infrastructure, as this was not a critical factor in their ability to sustain forces on the ground in South Vietnam. The Warsaw Pact poured billions of roubles of military materiel into Vietnam, delivered by sea via Haiphong and across the Chinese border. This materiel was then routed into South Vietnam primarily via the Ho Chi Minh Trail.

The Ho Chi Minh Trail comprised a network of routes through dense jungle terrain allowing the Vietnamese to construct a defacto highway grid, largely under the rainforest canopy, to deliver materiel from the north to the south in the vast tonnage required to sustain divisions of troops in the South. Many segments of the Trail were divided into short runs, with truck drivers responsible for their own mile or two of the Trail. Convoys or single vehicles would swap drivers at the end of each run so that a driver expert in the local road was at the wheel. This technique ensured that drivers were aware of problems, and they knew exactly where good hides put them out of the sight of patrolling US aircraft.



The ASD-5 Black Crow sensor was fitted to many reconnaissance and interdiction aircraft, including this AC-130A Surprise Package gunship. It could track ground vehicles using the radio emissions from their ignition systems.

Many of these routes were simply trails or footpaths used for centuries by local villagers, expanded and built up as the war progressed, typically with 18-foot wide gravel or pavement surfaces. Where gaps existed in the rainforest canopy, artificial camouflage was used to hide the roads. The Vietnamese and their Pathet Lao allies constructed local base areas, as storage nodes in this network of roads. These were often equipped with shelters, genuine bunkers, barracks, vehicle parks, hospitals and command sites.

By 1965, the People's Army 559th Transportation Group, responsible for maintaining and operating the Trail and led by Gen Phan Trong Tue, had around 24,000 troops in six truck battalions, two bicycle battalions, eight engineer battalions, and a boat battalion. Statistics for 1966 show that the Trail had grown to nearly 3,000 kilometres of road network, supplemented by resupply via the local river network. The engineering effort required bulldozers, graders and other road construction machinery. By 1968, more than 40,000 personnel were committed to construction, repair and operation of this vast resupply network.

The US recognised early in the Vietnam campaign the importance of the Trail, which increased further as the US Navy cut off coastal traffic used to smuggle arms and troops, and the US Army closed off land routes through the Demilitarised Zone (DMZ). Most of the Trail was located in

The OP-2E was a heavily modified P-2V Neptune used to deliver ADSIDs along the Ho Chi Minh Trail.

US Air Force crew member about to manually drop an ADSID sensor at the Khe Sanh perimeter in 1968.

Laotian territory, which created serious political complications for the US, constrained by treaty to treat Laos as a neutral state in the conflict.

In late 1964 Operation Barrel Roll was initiated to covertly bomb the Trail. By the middle of 1965 the daily sortie count grew from a handful to around 900 per month. By late 1968 progressive escalation resulted in sortie counts of nearly 5,000 per month, then about 10,000 by the end of that year.

Laos had become a major focus of the war effort for both sides. For the People's Army of Viet Nam it was the artery via which their forces in the south were sustained with replacement troops and materiel, and for the US it became the principal target for interdiction of PAVN resupply.

As the bombing effort progressively escalated the Vietnamese deployed AAA batteries, eventually totalling 1,500 guns – from ZU-23s and ZSU-23-4Ps up to 100 mm heavy AAA guns. The Strela-2M / SA-7 Grail MANPADS was deployed, and by the early 1970s even the S-75 Dvina / SA-2 Guideline SAM system was deployed to cover the Trail, claiming an AC-130 Spectre gunship in March 1972.

The dense jungle canopy presented a major challenge for the US in targeting the Trail, further complicated by the inventive PAVN and their expert Soviet / Warpac advisors. As the US ramped up their bombing effort, the PAVN shifted to nighttime operations to further complicate targeting. Optical sensors were largely ineffective in penetrating the canopy, as was ground-mapping radar. These remain largely unsolved technical problems four decades later.

The Igloo White effort emerged in 1968 when the US Air Force took over the trail interdiction effort, prior to that it was run by a joint structure labelled JTF728. The US Navy took a leading role early in the effort due to their extensive experience with the deployment and use of acoustic sensors, specifically sonobuoys used for finding submarines. The P2V Neptune ASW aircraft was soon adapted and sonobouy technology modified for use over land. These were the predecessor operations to Igloo White, labelled Dual Blade, Dye Marker and Muscle Shoals. The Royal Thai Air Force base at Nakhon Phanom became the home base of the sensor delivery effort over the Trail.

The most widely used sensors were air delivered 'geophones', essentially a military adaptation of the very same seismic detector technology used by exploration geologists in the oil and mining industries to analyse subterranean rock formations. A geophone is little more than a microphone designed to detect seismic disturbances in the surrounding soil. They are usually analogous to the design of an electromagnetic microphone. Implanted in the soil, they can detect the signatures of vehicles or even marching personnel from hundreds of metres or even greater distances, seismic conditions permitting. Geophones were supplemented by acoustic microphones, even capable of eavesdropping conversations.

Tens of thousands of ADSID (Air Delivered Seismic Intrusion Device) were mass produced in three basic variants, supplemented by a range of ground personnel delivered SIDs (Seismic Intrusion Device). The ADSIDs were hardy devices built to withstand thousands of G in shock loads when they hit the ground, embedding themselves, with up to six weeks of battery power available for operation. Like sonobuoys, the ADSIDs were equipped with a radio transponder, which allowed a patrolling aircraft to interrogate the sensor and extract the collected data.

The operational side of this effort is of much interest. Initially, most ADSID deliveries were performed by the OP-2E – four heavily modified P-2H Neptune airframes repainted in green, grey or black camouflage and flown by US Navy observation squadron VO-67. The standard ASW equipment was largely stripped out, a tail gunner station fitted with a pair of 20 mm guns and night vision equipment An APQ-92 search radar fitted together with a Side Looking Airborne Radar (SLAR), FLIR (thermal imager) and LLLTV (Low Light Level TV). The unique ASD-5 Black Crow homing receiver supplemented these imaging sensors, designed to detect and track emissions from automotive ignition systems. The aircraft was fitted with the A-6 Intruder's DIANE (Digital Inertial Attack and Navigation Equipment) and the World War II Norden optical bombsight for precision ADSID drops. Mufflers to the engines reduced the acoustic signature of the aircraft. For self defence, the OP-2Es were also fitted with a pair of SUU-11 6 barrel Gatling Gun pods, Mk.77 and Mk.82 free fall bombs. The role of the OP-2Es was the delivery of the ADSIDs and other armed reconnaissance.

The OP-2Es initiated the ADSID delivery effort in early 1967 but the increasing risks of ground fire caused the unit to disband in 1968, with deliveries performed primarily using USAF fighters which were better able to evade increasingly dense ground fire.

Several types of specialised gunships were developed for 'truck hunting' along the Trail. These included the 26 AC-119K Stinger conversions, the almost 30 AC-130A Plain Jane, AC-130A Surprise Package, AC-130A Pave Pronto, AC-130E Pave Spectre Herc conversions, and a pair of AC-123K Black Spot conversions. These aircraft were equipped with a diverse range of sensors and mission equipment, including TI Moving Target Indicator Radars, TI AAD-4 FLIR, GE ASQ-145 LLLTV, Black Spot receivers, laser rangefinder/designators, 20 kW searchlights, inertial and radio beacon navigation equipment, and additional communications equipment. Weapons fit also varied widely, and typically involved mixes of beam-firing SUU-11A Gatling guns, M61A1 20 mm Gatling guns, and in the C-130 conversions, also 40 mm Bofors guns and eventually a 105 mm howitzer piece. The most curious were however the two Black Spot aircraft, which carried an internal payload of up to 6400 cluster bomb submunitions in two containers, these being released through twelve chutes in the lower fuselage. The Black Spot aircraft would literally carpet an area with submunitions.

While not used against Trail targets, the twelve AP-2H Neptune gunships developed by the US Navy were equipped with no less than eight Honeywell XM-149 belt-fed 40 mm automatic grenade launchers in their bomb bays, firing forward at a depressed angle to carpet a swath with 40 mm grenades.

The specialised loitering gunships were often escorted by defence suppression fighters, and fighters performed most of the strikes on the most heavily defended Trail targets, with other strike aircraft such as the obsolescent Martin B-57 Canberras.

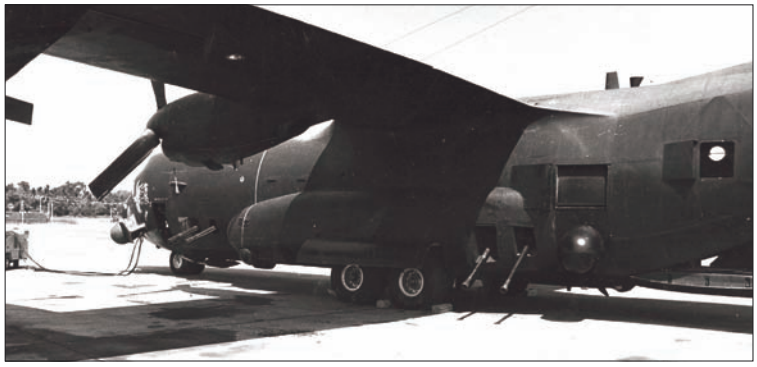
While the armed reconnaissance, sensor delivery and gunship aircraft are the best known aspects of the Trail interdiction effort, the 'back end' to the sensor network is no less interesting.

The ADSIDs and other sensors such as parachute retarded battery powered microphone sensors designed to remain suspended in the rainforest canopy, had to be monitored and the data from these devices collected, concentrated, sorted, analysed and assessed before targets could be struck.

One of the realities of a small battery powered device stuck in the rainforest floor, with a wire whip antenna, is that it cannot achieve very much transmission range – the further it transmits, the faster it drains its battery, and the sooner it has to be replaced by another drop, putting aircrew at risk. This is complicated by the realities of densely forested and mostly hilly terrain, where the geography itself may limit the radio footprint of a sensor to the inverted cone in space above it and little more. Therefore, radio relay aircraft were required to collect signals from the implanted sensors and datalink them to the operational headquarters at Nakon Phanom.

This was the task of the 553rd Reconaissance Wing's EC-121R 'Batcat' Super Constellations rebuilt from EC-121 AEW&C aircraft. These aircraft were equipped with racks of transceivers to collect data from the implanted sensors, and a ventral X-band datalink radome with a steerable dish antenna. This provided a narrow beam downlink to the Nakon Phanom facility, which had four dish antennas on towers to follow up to four orbiting

Fairchild AC-119K Stinger gunship used for truck hunting.



The AC-130A Surprise Package was one of the earlier gunship conversions, armed with rotary miniguns, M61 rotary 20 mm cannon, and a pair of Bofors 40 mm cannon.

A rare image of one of the two AC-123K Black Spot aircraft, each equipped to drop up to 6,500 cluster bomblets through 12 chutes in the lower fuselage.

The EC-121R Batcats were radio relay platforms, which collected signals from ADSID sensors and relayed them via a steerable X-band datalink to the ISC at Nakon Phanom.

Batcats. The Batcats were later replaced by QU-22A Pave Eagle aircraft modified from Beechcraft Debonaires, and intended to be used as UAVs. After several were lost in accidents pilots were put back into them. These flew from Udorn and Nakon Phanom.

The centrepiece of the Igloo White effort and nerve centre of Task Force Alpha was the Infiltration Surveillance Centre (ISC) at Nakon Phanom, often described as the single largest building structure in South East Asia at that time. The ISC was air conditioned and pressurised to keep external contaminants and dust away from the large array of computer equipment. Personnel had to wear sneakers inside the facility, which they would trade with their footwear upon entering or leaving the facility.

The core of the computing package in the ISC were a pair of IBM 360 mainframe computers with a large array of nine-track magnetic tape drives and hard disk storage units – at that time a typical hard disk drive was the size of a washing machine.

The war room in the ISC was modelled on the then new command centres for the NORAD and BMEWS systems, using IBM 2250 consoles. A large 24 x 9 foot perspex map board was used to locate detected enemy units. The console operators could often track the movement of PAVN trucks along the Trail in real time, as the individual ADSIDs were triggered by passing traffic. According to one US source, the outputs from the ADSIDs and microphone sensors were also recorded by the Batcats and later used for intelligence analysis.

The ISC concentrated, sorted and analysed the collected sensor data, providing raw intelligence for strike sortie planning. Highly experienced analysts were able to recognise specific vehicle types from their acoustic/seismic signatures.

Once the Igloo White effort gathered momentum the campaign shifted to a game of cat and mouse, as the PAVN did its best to deceive the US operators rather than disable sensors. In turn, the US often delayed air strikes so as to confuse the PAVN as to the location of the various implanted sensor arrays.

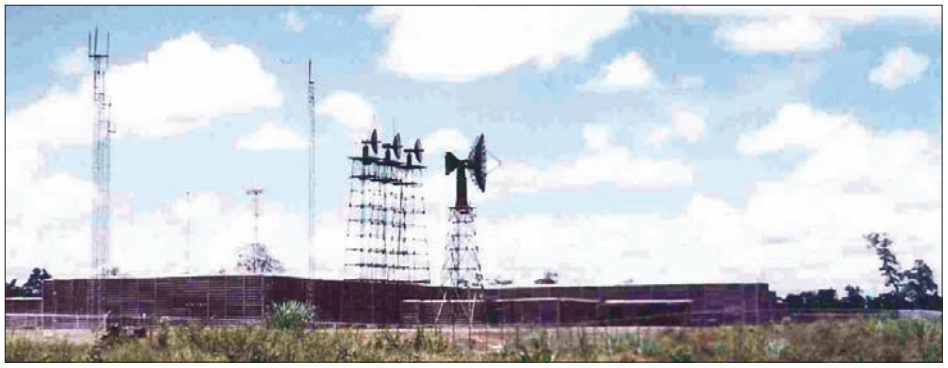
There is continuing controversy in the US as to the practicality and utility of the enormously expensive Igloo White operation. Was it a success or a failure? Proponents cite the large sortie rates, the verified bomb damage assessment results, and point to the alternative of an unfettered flow of materiel from the north to the south, as well as the strategic impact of the resources consumed by the PAVN to maintain and defend the Trail. Critics argue that Igloo White made no difference, citing the eventual collapse of the South as the ultimate proof.

How much damage was actually inflicted is hard to objectively determine, since the Vietnamese have yet to open their archives fully to permit researchers to total PAVN losses along the Trail. The Vietnamese did disclose some years ago that the war cost them over three million uniformed personnel killed in action, or remaining MIA to this date a large fraction as a result of US bombing attacks in the south and elsewhere.

What is clear is that Operation Igloo White remains one of the biggest specialised Intelligence Surveillance Reconnaissance campaigns mounted to date, and in sheer scale compares to other Cold War and World War II programs aimed at collecting sensor data over large geographical areas. That alone makes it a worthy subject of study.

Further Reading:

http://www.afa.org/magazine/Nov2004/1104igloo.asp
http://home.att.net/~c.jeppeson/igloo_white.html
http://www.vo-67.org/vo67_opening.html
http://www.globalsecurity.org/military/systems/aircraft/ac-123.htm



Infiltration Surveillance Center at Nakhon Phanom. The four dish antennas on towers were used for microwave downlinks from the EC-121R Batcat radio relay aircraft.