(C) The variety exists because each sensor has inherent weaknesses. For example, the infrared type which uses an interrupted beam to trigger the alarm is susceptible to false alarms by blowing dust, the trespassing of animals, and the like. At the same time, the seismic detectors, which seem to be the most promising of the group, can be triggered by artillery or mortar shells landing some distance away. And, of course, no single sensor can distinguish between friend and foe.

(S) The principal personnel and vehicle sensors in use in Vietnam during 1968--which are undergoing continuing refinement--were as follows:[12]

1. HANDSID. The Hand Emplaced Seismic Intrusion Detector is a small, self-contained device with a geophone sensor, detector, transmitter, self-destruct system, and 45-day battery power supply. When properly buried, the device picks up the earth vibrations caused by walking or vehicular traffic and, after transmitting its individual identification code, transmits 10 seconds of audible signal--a continuous tone for vehicles and rather sharp, impulsive tones for foot-steps--to the monitor. To prevent use by the enemy, the self-destruct system functions on a preset time. At the end of the battery life or when a circuit malfunctions or is interrupted by tampering, the device automatically self-destructs.

2. HELOSID. The Helicopter Seismic Intrusion Detector operates on the same principle as the HANDSID and is used for the same purposes. The HELOSID, however, is an expendable item designed to be dropped by helicopters at airspeeds of up to 120 knots and altitudes of between 50 and 500 feet. Stabilizing fins, which extend when the device is dropped, insure proper impact with the ground. As with the HANDSID, seismic disturbances are picked up and relayed via the transmitter to monitoring aircraft.

3. ADSID. The Air Delivered Seismic Intrusion Detector adds further flexibility to the sensor program. Thirty-one inches long with mounting fins for stability, it is a self-contained, expendable, camouflaged seismic detector that is best seeded by the fixed wing OP-2E flying at 170 knots at an altitude of 2,000 feet. The ADSID is designed to bury itself some 28 to 40 inches in the ground, under normal soil conditions, with the whip antenna and four radiating wires--disguised as plants--remaining above ground. Properly seeded, it can detect personnel up to 30 meters away and vehicles up to 300 meters and distinguish between the two by transmitting a broken or solid tone.

4. FADSID. Another refinement of the basic seismic detector is the Fighter Aircraft Delivered Seismic Intrusion Detector. It is very similar in size, weight, and function to the HELOSID except that it can be seeded by high speed F-4 aircraft flying at airspeeds of between 250 and 600 knots and at altitudes from 500 to 5,000 feet above ground level. Like all aerially seeded, expendable sensors, the FADSID uses preset channels for its RF transmission, channels which are monitored by an aircraft locally or passed by data link to a surveillance center. The FADSID, however, also contains a receiver that allows it to respond to commands originating from the aircraft or surveillance center. In addition, the unit transmitter can relay real-time readout detections or it can relay detections made over a previous time period which have been stored in its "memory unit."

5. The Acoubuoy (AN/GSQ-117), as its name implies, uses sound as its basic triggering principle. The device, which is dropped by parachute from fixed wing aircraft, is designed to hang suspended above the ground when its parachute becomes entangled in the foliage. Properly placed, the system can detect vehicles up to 400 meters and "button bomblet" detonations up to 360 meters. Detection of the appropriate sounds triggers the unit's transmitter

which sends a coded identifying signal to a monitoring aircraft or ground receiver and then transmits the actual sounds received. Like most other expendable sensing systems, the [illegible]buoy has a self-destruct capability when its power source runs down or when someone tampers with the mechanism. Thus, the very absence of a signal when the system is "alerted" from the monitoring aircraft, can, in some instances, be taken as evidence of intrusion.

6. APD or "Sniffer." The Airborne Personnel Detector was first introduced in Vietnam in June 1967 and has been undergoing testing and evaluation since that time. A maverick of the family of sensors, the APD samples the air for products of combustion, such as carbon particles, and human effluents, such as ammonia. Using sensitive instruments, the presence and the amount of these "foreign" bodies can be measured. The APD is also remarkably free from error. In tests at the end of 1967, false alarms registered less than 30 percent. These initial sensing devices, however, were too delicate for their mission, and procurement during the year 1968 was dependent upon certain modifications to improve their ruggedness.

7. PSID. One of the most promising sensor systems under testing and evaluation throughout 1968 was the Patrol Seismic Intrusion Detector. Small enough to be effectively handled by a patrol, the system consists of four geophone seismic sensor-detector-transmitter packages, each of which weighs about 20 ounces, and one radio receiver. Each sensor can detect individual footsteps at 30 meters and while each transmits its signal on the same frequency, each has a differently coded impulse so that the monitor can distinguish between sensors. The advantages of this system are significant, primarily because it can be utilized at the tactical level. It can detect approaching forces or, perhaps even more important, enemy forces following a patrol. Moreover, it gives exact information as to location and permits reliable estimates as to size.

(C) Other sensors in use and/or undergoing evaluation in SEASIA during the year included the Infrared Intrusion Detector (IRID) which uses a broken infrared beam to initiate the alarm system (there is also a miniturized version of this system); the Balanced Pressure System (BPS), which uses buried hoses filled with water to detect earth vibrations; the Unattended Seismic Detector (USD) which utilizes a series of interconnected geophone sensors together with an appropriate relay system; the Magnetic Intrusion Detector (MAGID) which uses individually placed sensors to detect the passage of ferromagnetic material, such as rifles, knives, etc.; and the Multipurpose Concealed Intrusion Detector (MCID) which utilizes magnetic current flowing through links of copper wire buried a few inches underground. The MCID, through its detection and relay system, sounds an alarm when ferromagnetic material passes through its force field. This particular sensor has the advantage of presenting a solid detection barrier up to 250 feet long for each detector used.

(TS) Overall, 1968 was a year of both success and frustration for the sensor program. Individual sensing devices worked well enough to warrant investments of huge sums of money in the refined and more reliable phase II series. Moreover, massive and generally effective systems, using a variety of types of sensors, have been set up along the DMZ and the Laotian border (see that portion of Chapter X entitled "Anti-infiltration Barriers). Also, both personnel and vehicle detecting sensors were used extensively during the seige of Khe Sanh (January 1968), in the vicinity of Saigon during Tet (Jan - Feb 1968), and during the May - June offensives. The success of sensors in the more recent cases, however, was not nearly as spectacular as their contribution at Khe Sanh where, in the words of COMUSMACV, the operation "demonstrated the utility of sensors for monitoring movements of enemy troops and vehicles in tactical environment." [13]

(TS) The major frustrations with the sensor program centered around the lack of sensors, although there was some dissatisfaction with what might be called "technological restrictions." These limitations included the inadequacy of frequency space for the sensors to transmit without interfering with each other, the lack of workable, hand-emplaced sensors, and the lack of adequate local readout capability.[14]

(TS) On 1 April 1968, COMUSMACV expressed concern to Washington of "inadequate supplies" of sensors and stated his belief that great emphasis should be placed on "expanded production of sensors in numbers and diversity adequate to support in-country as well as out-of-country applications." He also recommended the following:

1. Development of new sensors that capitalize on the special accessibility and permissiveness of the in-country environment.

2. Development of portable/mobile sensor readout and interpretation capability suitable for the several categories of in-country sensor applications envisioned.

3. Development of a variety of equipments, concepts, and tactics for in-country sensor employment, ranging from small, static outpost protection to large dynamic offensive operations.

4. Establishment of a production pipeline to support the growing sensor requirement.

5. Establishment of a CONUS training base for the provision of specialist crews to man the sensor emplacement and readout operations.

6. Development of concepts and equipment (e. g. communications) for integrating sensor information into the field intelligence systems to provide quick reaction strike capability.[15]

(TS) Toward the end of the year, the Defense Communications Planning Group (DCPG) was still concerned about "sensor shortage" and "continued slippage of production." At the same time, however, it spoke of "massive engineering reviews" to open up the bottlenecks. This emphasis, of course, was in keeping with COMUSMACV's earlier recommendation that "steps be taken as rapidly as possible to assure the discriminating development and well-planned employment of a spectrum of sensors that could accelerate realization of the great promise of this new technology."[16]

Camp Sentinel Radar

(C) The Camp Sentinel Radar (CSR) system represented a significant R&D effort to provide ground surveillance in defense of small to medium sized base camps located in areas partially or completely surrounded by foliage or wooded areas. The basic concept was that the system, a 360° electronic scanning Doppler radar, would penetrate the foliage and detect any radial movement between 1/2 and 11 mph to include men walking or running. This unique ability was possible because the system could cancel out returns from "fixed" objects, such as trees, or rhythmic motions, such as those coming from swaying branches.[17]