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CAPT. JOHN P. GREY

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The following narrative is a review of the history of Ranch Hand, and my personal observations on the overall effectiveness versus the cost of the program. I have had to rely on my memory and the few accounts that have previously been written. It is my intention to acquaint the reader with the money and resources that this project has utilized to date, the results, and my opinion on the effectiveness of the overall program.

The idea of denying the Viet Cong (VC) insurgents cover along lines of communication in order to prevent or deter ambushes dates back to the First Indo-China War. The French used ground crews to cut the trees and burn the foliage along major highways. This work is still apparent along National Highway 13, from Saigon to Loc Ninh as well as other areas. In some places the road side is cleared back a distance of approximately fifty yards.

In the summer of 1961 the U.S. Army in cooperation with the USAF went ahead with plans to equip six C-123 aircraft with an MC-1 tank and the necessary plumbing and wing booms to dispense a foliage killing chemical along lines of communication and safe haven areas. On November 29th 1961, six C-123s, crews, approximately 100 enlisted men, one complete fly away kit and all necessary support equipment, aided by two C-124 aircraft deployed to Clark AB, P.I.. Tactical Air Force Transport Sq. Prov. #1 (Ranch Hand) arrived at Clark AB on December 9th, 1961. After approximately ten days two aircraft proceded to South Viet Nam. In early January the first test strips were flown along Route 15. While evaluation of these areas was taking place, one aircraft was lost on a low-level training flight with the loss of the crew. As a result of the evaluation it was determined that in order to be most effective the foliage must be treated during the growing season and a deposition rate of 1½ gal/acre must be applied. A modification to increase the flow rate was completed in May of 1962. During the interim period the aircraft were used for airlift in the troop carrier squadron. The second aircraft was lost attempting a take-off from an extremely short field. In mid-May of 1962 two aircraft were ordered to return to the States. One aircraft returned to Langley AFB via Iran and Afganistan where it sprayed locust. The other aircraft returned to Langley via the Pacific route. There was no defoliation performed from March 1962 until the last week in August 1962. In August of 1962 we were given the green light on a number of canal and river targets in the Cau Mau area. This work was personally witnessed and evaluated by General Delmore who was the Army Chemical Officer. As November signaled the end of the rainy season, work stopped with the exception of one target; a pass south of Qui Nhon. From approximately February until our unit flew support and calibration missions

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for the Decca project officer, target aircraft for the F-102s, and defoliation survey flights.

In September of 1963 I returned to the States and remained there until May of 1964. During this period the mission remained relatively unchanged. A deposition rate of 3/gal acre appeared necessary requiring two passes over the same area. Fighter cover and helicopter rescue were utilized on all flights and the C-123 aircraft dropped smoke grenades if ground fire was observed or encountered in an effort to assist the FAC and fighters. Prior to March of 1964 ground fire had been rather light and widespread. However as the VC gained greater control of the countryside in the delta, opposition increased considerably.

Since it became evident that 3 gal/acre was required for maximum effectiveness and the dispensing system was only capable of dispensing $1\frac{1}{2}$ gal/acre, a new system was installed that incorporated a more powerful pump capable of pumping the required number of gallons per minute. This system allowed us to dispense 3 gallons per acre on one pass thereby reducing fire exposure time. This system was installed in August of 1964 and is presently in the aircraft.

From November of 1961 until June of 1964 all the officer personnel assigned to this unit were on TDY duty from Langley SASF with the exception of the navigators.

From August of 1964 until November of 1964 mission work continued. In October of 1964 the first crop target was worked. Work of this nature will not be discussed here. Prior to October of 1964 all targets were lines of communication or safe haven areas.

At this point it is important to explore a cost to date.

1. The equipment that was installed in the six C-123s originally was already in the AF inventory. The only modification that was required involved construction and installation of wing booms, flex hosing from the cargo compartment to the wing and a small amount of electrical wiring that was necessary to give the pilot control of the valves. The cost of these modifications are unknown.

2. The cost of deploying 6 C-123s and crews, over 100 enlisted men, 2 C-124 support aircraft, all the necessary support equipment, personnel equipment and supply, is impossible for me to estimate. Project Ranch Hand was in actuality a provisional sqd..

3. All officers and enlisted men (flight engineers) assigned to the unit were TDY from 20 November 1961 until June 1964. This represents many dollars in TDY funds.

4. Since its origin Project Ranch Hand has flown a total of 4200 hours. This time represents crew proficiency time, surveys, some airlift support time, miscellaneous, as well as actual mission time. This represents a cost of $714,000.00.

5. This unit has dispensed approximately 619,732 gallons of "purple!" 24D-245T chemical. The average cost per gallon is $ 8.50 . This represents a total of $5,267,722.00.

6. Two C-123s have been completely destroyed with the loss of 3 lives.

7. Each aircraft has undergone 2 modifications since they were deployed to Vietnam. The cost of these modifications are unknown to me.

8. The cost per acre based upon 1½ hours flying time per sortie is $26.35 .

9. The cost in fighter support, ordinance, and helicopter rescue is impossible for me to estimate.

The preceding paragraphs were intended to acquaint the reader with cost and resources that this unit requires. No mention was made of A/C maintenance cost since I have no idea how to determine it. It should be evident that this is an extremely expensive operation.

RESULTS: Just what are the results of this chemical being applied in this manner? In almost all cases the post survey is conducted from the air due to the insecurity of the countryside. Using a roadside or river bank as an example, having been treated during the growing season, you will observe the first signs of brown in roughly 2 days after application. The first plants to die are the broad leaf grasses followed by the brush, small trees and finally the large trees. Depending upon the nature of the foliage the treated area appears dead or barren in 30-60 days. Generally, ... vertical visibility has increased 50-80%. However the increase in horizontal visibility is sometimes extremely low since the trees and bushes are still standing. One group of "flame trees" on TSN air base were treated in February of 1962. The trees finally fell over in July of 1964. Along road sides after 2 to 8 months ew grass is growing and often reaches 3 feet after 5 months of growth.

1. Drawbacks: Many types of trees and grasses were uneffected by this chemical. Some types of trees turn slightly but "bounce back" and continue growing.

2. Horizontal visibility often remains poor due to the standing dead trees and bushes. It is known that the VC plant certain types of grass along a river that has been defoliated to facilitate future ambushes.

3. In almost all cases vertical visibility increases, however, to my knowledge this has never revealed insurgent troop movement or presence.

Since the majority of our work has been lines of communication in an attempt to deter ambushes it might do well to discuss an ambush.

An enormous amount of time and study has been spent exploring different ways to prevent or minimize the effects of an ambush. After all this information is sifted the counterinsurgent is faced with the fact that it is literally impossible to prevent them regardless of the nature of the surrounding terrain and tactics.

Let's examine a typical ambush.

A convoy of vehicles proceeds along the highway. Ahead at a pre-selected point the advance of a convoy will be halted by mines, recoilless rifles or physical blockage. As the convoy's forward motion is halted, the retreat route is blocked in the same manner. The attacking forces (infantry) attack from one side of the highway covered by machine or automatic rifle fire. The opposite side of the highway is usually mined and covered by mortar fire. The convoy personnel are forced to fight from an exposed position and since the convoy is most always faced with a superior force, the results are disastrous. The ambush described above is typical in the sense that most ambushes are planned in such a way as to stop and prevent the advance or retreat of the column. One flank of the column is attacked by infantry covered by automatic fire while escape in the other direction is prevented by mortar fire and/or mines. One requirement is necessary for a successful ambush. The insurgent must have a relatively clear field of fire in order to stop the convoy, cover the advance of the attacking force, and provide cover for the withdrawal. During the French Indo-China War, the French cleared the roadside the most effective way possible. They cut down and removed the trees and cut and burned the remaining underbrush. The results of these efforts are inconclusive. One thing is certain, in their efforts to decrease the chance of ambush they increased the enemy's field of fire considerably. Since the VC are masters of camouflage and infiltration no highway or canal is safe from an ambush.

The VC have mastered the art of the ambush and the psychology of ambushes. They spring one where you would least expect one to occur. Devastating ones have occurred along highways where the sides of the road are clear except for grass. These are particularly disastrous because there is little cover for the troop column or convoy being ambushed, the supporting automatic fire has a clear field of fire, and the attacking infantry force previously camouflaged close to the line of movement has little difficulty advancing.

Another classic performed in May of 1964 and used successfully again is described here. This ambush uses no cover at all (in the sense of trees or grass).

A troop column proceeds along a dyke or small road through open delta country. On each side of the line of march there is no cover. The earth is parched and apparently undesturbed. However, one flank is mined and retreat in that direction is also deterred by one or more machine guns placed ahead of the line of march and firing into the column head on. The opposite flank contains the attacking force dug in level with the ground and covered with planks and the earth replaced. The signal for the ambushes consists of heavy automatic weapons fire from the flank containing the attacking force. Because of the exposed position of the troop column initial casualties are extremely high. The column is prevented from retreating to the one flank by mines and forward by machine guns. Cover is sought in the other direction but now the attacking force has sprung from their holes and are firing at point blank range. This type of ambush was witnessed by an L-19 pilot flying cover. He circled above astonished at the scene below. Almost the entire company was lost following the hand to hand combat.

The problem of preventing ambushes is enormous; convoy discipline, flank, point, and rear security, FAC, and air cover can minimize the effects of the ambush. And by all these factors being present they may serve to deter the enemy from laying one. However, in view of the enormous cost and risk involved in defoliation versus the amount of cover completely removed, I feel the defoliation program is extremely insufficient. Ambushes have taken place in areas that have been defoliated. The power line from Dalat to Saigon has been defoliated but this did not prevent the Viet Cong from destroying 12 highline poles and rendering the line useless.

If clearing lines of communication completely to a distance of 300 to 400 meters truly will prevent or appreciably reduce ambushes then it should be done. It should be done the most effective way possible. That is, by cutting and burning the foliage and keeping the grass cut. This could be done by the local population and wages paid by the central government. This

would provide income as well as timber for the local population.

From the standpoint of propaganda and Psy Ops this operation is perfect material for the Communists. Interviews with VC, who have rallied to the government of Viet Nam (GVN), indicate that the Front for National Liberation (FNL) propaganda teams waste no effort in pointing out to the peasants that their homes and surrounding crops were destroyed by Americans and GVN personnel. Any unusual phenomena that occurs afterwards regarding diseases, animal, human or plant, are immediately blamed on this operation. GVN PsyOps are generally ineffective since they lack the person to person contact method used by FNL propaganda teams. Generally, from a psychological standpoint, the VC benefit most from these operations.

In my opinion, in view of the cost and risk versus the amount of cover completely destroyed and rendered useless, this program is inadequate and should be terminated.

The second area of interest is the denial of safe haven areas to the insurgent.

Just what is a safe haven area and how is it organized and protected? The following is an extract from the book The Resistance Will Win written by Trung Chinh in 1947. Trung Chinh at the time of the writing was the "Party phylosopher" for Ho Chi Minh "during the hectic 1945-1946 period" in the development of the DRVN (North Viet Nam). He later became Vice Premier of the DRV.

Dr. Bernard Fall describes his book as "timeless" and his writings "as valid in 1963 as they were in 1947".

EXTRACT FOLLOWS

7. Resistance bases - A resistance base is an area in which it is relatively safe for us to train our regular army, train cadres, produce arms and munitions, tend our wounded, etc.

There are many kinds of bases: mountainous areas, in the delta and in marshy areas.

Areas fit for the establishment of such bases are those where:

a) The people are active, widely organized and ready to support the army in every field.

b) There are regular troops ready to make sacrifices and hurl themselves forward to stay the enemy's advance, to safeguard the base and defend the leading organs and the population.

c) The natural features of the country are favourable to our defense.

Of the above three conditions, the first two are of course the more important. Where there are neither forests nor mountains, if we have regular forces with a high morale and broad masses who are politically conscious, these will constitute human forests and mountains to protect us.

There are people who think that because our territory is small, it is impossible for us to establish resistance bases. Such a conception is wrong. It comes from an overestimation of the enemy's forces. Though our territory is small it is not so small that it is impossible to set up resistance bases in it. Moreover, the enemy forces are limited, they come from afar. It is certain that they cannot wipe out and annihilate our forces, and they have not sufficient forces to occupy our whole territory and prevent us from getting a foothold.

Others consider that a resistance base is an absolutely safe area where we can carry out construction on a large and permanent scale. This viewpoint is also wrong. It comes from the overestimation of our own forces. No base can be absolutely firm! That is why we must not and cannot build anything that, while it may be imposing, is cumbersome and difficult to move in case of need.

When we occupy a place, we must have always in mind the moment when we may have to leave it. When we defend a place, we must always have in mind the moment when we may have to abandon it. However, we should not make the mistake of thinking of a base as merely a place where we quarter our troops. The "one day base" of which the comrades in Quang Tri have often spoken was only a temporary cantonment, no more and no less.

When we choose an area as a base we should convene a conference of high-level cadres of the army, the administration and of the people's organizations of the region to discuss the establishment and defense of the base. The following questions require prime attention:

1. In mass work, we should develop and consolidate the mass organizations (prepare underground groups), and train local cadres to maintain and lead the mass organizations in the region.

2. In military affairs, we should widely establish militia forces and arm the entire people, giving the young people military training; we should dispose the regular forces and weapons necessary to check the advance of the enemy and to destroy his forces once they have penetrated deep into our base area; we should conceal military

objectives, and endeavour to prevent enemy planes from causing us harm.

3. As for the people's well-being, production should be increased according to a determined plan; supply must be organized and the people's living conditions improved.

4. Concerning security, we should wipe out traitors to the nation, restrict and control the circulation of persons, and deprive the enemy of all news.

END EXTRACT

It is apparent that militarily and politically the safe haven area described above is a tough nut to crack. The area will be well defended and protected by excellent intelligence.

The Boi Loi forest operation represents a major effort to destroy a safe haven area.

In January of 1965 the Boi Loi forest was defoliated. Prior to the defoliation operation, tons and tons of ordinance was expended in the area to suppress possible opposition. Very little opposition was encountered, and from the standpoint of application it was an excellent job. After about 2 months a futile attempt was made to burn the forest.

From the Viet Cong standpoint just what took place after the operation started? Intelligence during the period and about this area is poor. However, from what we know and can assume, certain things did happen.

1. The insurgents immediately obeyed their own rule. The majority of them left leaving behind only an infantry company. The mission of this company was twofold. They were necessary to provide intelligence on the area. Were ARVN forces being deployed into the area in conjunction with the defoliation? To what extent was the bomb damage? Would the area be suitable to use later? The second one was probably secondary; that of shooting at the aircraft.

2. The civilian population fled the area with 315 families seeking help from the GVN.

After the operation was well underway the amount of information we received about conditions inside the area was greatly reduced since the major source had been the civilian population. No major sweep was made into the area to truly destroy the facilities inside.

The vertical visibility was increased considerably, however, this did not reveal the insurgent's facilities.

The Boi Loi operation required 78,800 gallons of chemical, 94 + 20 flying hours, as well as 256 fighter sorties and 32 helicopter sorties.

The overall effectiveness of this type of operation is doubtful. The increase in vertical visibility is generally insufficient to reveal insurgent's facilities or movement and since the civilian population is forced to leave the government loses its intelligence source about the area.

The total destruction and denial of a safe haven area will require:

1. A military (infantry) operation of sufficient magnitude to force the insurgent to abandon his position.

2. The occupation of the area for a length of time sufficient to destroy the existing facilities, tunnels, defensive positions, hospitals, training facilities, arms and food storage caches.

3. In order for the area to remain unusable the total population must be pacified and throw its support behind the GVN. This means that the insurgent political organization must be infiltrated, subverted and destroyed and a more desirable political organization established. If this is not done there is nothing to prevent the insurgent from returning to the area after the military operation has ended. His facilities will have been destroyed but he still "governs" the area and will simply rebuild.

The physical destruction of a safe haven area is economically impossible and undesirable. The denial of an area to the insurgent will require people living in or around the given area. If the area is defoliated it becomes impossible to work and live; the local population abandons the land and there is nothing to prevent the insurgent from returning to the area undetected. The counter-insurgent needs information on the whereabouts of the insurgent and the local population is his best source.

This information could be gathered by armed recon teams but their survival is questionable in an area that is heavily protected and patrolled by the insurgent himself. They must depend on supplies from outside the area for subsistence and if

this is impossible their activity in the area is largely governed by the amount of resources they are able to carry on their backs.

The large and historical safe haven areas in South Viet Nam present an extremely difficult problem. War Zone D is a perfect example. The major portion of Zone D is mountainous, prime jungle. This area is relatively underdeveloped and uninhabited and as a result current intelligence is difficult to get except from armed recon teams whose presence is limited by resources on hand. Large scale sweeps through small portions at a time appear to be the only way to destroy a safe haven area of this type. Large forces sufficient to prevent their own annihilation are required. These forces must also be large enough to remain in the cleared area while permanent bases can be established. The newly created outposts must be prepared to continually patrol and recon their sector. Because this process requires an enormous number of foot soldiers it will be a slow process of expansion. However piece by piece, government control can be extended in this manner. New land then becomes available to the population and economical development can follow. However, a favorable balance in forces must be available. Each outpost must be able to survive the heaviest assault. If the man-power is unavailable further extention of government control must wait until the resources become available.

Land and population that the counterinsurgent is unable to control is to a degree a safe haven area and will remain so until he establishes or re-establishes his control over it.

The permanent and lasting denial of safe haven areas can only be achieved through a process of development and expansion and not destruction. Lines of communications must be protected and safe haven areas must be denied, however, it cannot be effectively done by air. It requires a coordinated program of political and military expansion using the same tools that the insurgent uses.

JOHN R. SPEY
Capt. USAF