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The process of destroying foliage by dispensing chemical from an airborne vehicle improved the ability of the airborne observer to evaluate hostile movements and decreased ambush incidents in critical areas.

The success of this operation in Malaya was experienced during a phase of insurgency when the guerrilla was ill-equipped with antiquated weapons and low level flight maneuvering was conducted with a minimum of resistance. Fighter escort for spray aircraft was not a requirement since most areas were secured by ground force units prior to defoliation operations.

In Dec 61, six C-123 spray equipped aircraft were deployed to SEA. The year 1962 was spent in experimentation, with approximately sixty testing and training sorties flown. No ground fire was experienced as all areas were secured. During 1962 the C-123 spray aircraft inventory was reduced from six to four via non defoliation accidents.

The year 1963 was spent in limited operations as target acquisition procedures were cumbersome and few targets were obtained. Non secure areas were increasing and during 1963 approximately 12 ground fire hits were recorded while approximately 107 sorties were flown on a limited number of lines of communication type targets. Because of activity versus resources the C-123 spray equipped aircraft inventory was reduced from four to three as one C-123 was returned to the ZI.

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Downgraded 24 Mar 1970 DoD Security Officer

GROUP 4

Downgraded at 3 year intervals; declassified after 12 years

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~~SECRET~~ ~~CONFIDENTIAL~~ 13 June 65

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It was during this same year (1963) that fighter cover became a requirement. Fighter cover, however, was ineffective due to restrictive VNAF/USAF Rules of Engagement. Fighter cover could not be an offensive escort tactic but had to be a defensive post strike and cover for rescue effort. Fighter aircraft could not fire upon ground emplacements until the C-123 spray aircraft had been fired upon first. This "B. Post Facto" (post strike) tactic did not assist in reducing potential ground fire actions but was primarily a retaliatory tactic. The defoliation aircraft were, in fact, decoys for the fighters and the prime purpose of the assigned fighter aircraft was to provide cover for downed air crews until rescue was accomplished.

It was also during this same year that the defoliation mission versus the state of hostility in RVN no longer paralleled the phase of insurgency conditions that existed in Malaya. Ground fire in RVN was on the increase and secure areas on the decrease. Hostile forces were also becoming better equipped with more modern weapons and low level defoliation flying was becoming a much more hazardous operation.

NOTE: The C-123 aircraft turned out to be an excellent choice for chemical delivery in a hostile environment as it is a rugged air frame with simple and duplicate supporting systems and is powered by two reciprocating engines of the most dependable type.

Throughout the entire period from 1963 thru 1964, when ground fire was on the increase (a total of 139 hits per three aircraft), not one crew member was killed nor an airframe destroyed due to ground fire. Very little credit can be given to fighter tactics during this period as the Rules of Engagement would not permit offensive actions. Survival of aircrews and airframe must be accredited to the skill of the crews and the ruggedness of the airframe, for many emergencies were experienced

RH 67 0017

and numerous injuries were sustained.

During the first six months of 196[illegible] approximately [illegible] sorties were flown with post strike fighter support and [illegible] 32 ground fire hits were recorded. During the last six months of [illegible], 169 sorties were flown with post strike fighter support and 2[illegible] ground fire hits were recorded.

In Dec 64, 2d Air Division insisted on free strike zones in all areas where defoliation projects were to be performed. This procedure would eliminate the Rules of Engagement and provide the fighter tactician with a clearance to develop offensive escort tactics that could reduce the number of ground fire hits which were on the increase in number and caliber. In Dec 64 the C-123 spray equipped inventory increased from three to four aircraft based on an increase in target acquisition.

In Jan 65 the defoliation of a strategic "safe haven" and free strike area was attempted for the first time. A large area (7X13KM) of jungle foliage, stronghold of the VC for seven years, was the target. Intelligence reports and forward air control sightings indicated that ground weapon emplacements, 30 and 50 caliber, plus some 4000 VC necessitated maximum Fighter, FAC and Rescue resources be used. The pre-strike, offensive escort and post strike tactics developed during this operation proved to be of value when, for the first time since mid 1963, the total ground fire hits received per sortie were reduced by approximately 7[illegible]%. The ground fire hit ratio was reduced from a former .6 hit per sortie ratio, to that of .25 per sortie. A total of 99 sorties were flown, with fighter protection, and only 22 airframe hits were recorded. During this period the element of surprise was nil, the desired alteration of

low level track was unatainable, and evasive actions were almost impossible.

The number of fighters required and tactics used to support a given number of defoliation aircraft, on a predetermined low level track, have been continuously modified to cope with the continuing increase in ground fire activity; however, the basic plan of fighter cover operations developed during the first Safe Haven/Free Strike area project (Jan and Feb 65) has become the established criteria for fighter resources and tactical procedures for herbicide projects to be conducted within this hostile environment. From 1 Jan 65 to 25 May 65, a maximum effort in operations was maintained and a total of 305 sorties were flown. Even though the prescribed numbers of fighters and the proper type tactics were used, the total hits received by spray aircraft were 216.

During April and May 65 a mangrove "Safe Haven/Free Strike" area in IV Corp was about 75% completed when 2d Air Division terminated operations. Suspension was directed on 25 May 65 due to the increase in C-123 battle damage and ground fire hit versus sortie ratio. During this project 84 sorties were flown and a total of 124 30 and 50 caliber ground fire hits were received. Numerous emergencies and several injurieswere recorded. The hit ratio rate increased to 1.5 hits per sortie.

The comparative increase in the hit ratio is accredited to an increase in the mobility of the [illegible] and the much improved quality of their weapons.

The total fighter resources that could be safely flown within the air space required for this operation could never eliminate ground fire hits. The long periods of low (500' to 100') and slow (100 to 150Kts) flight and prolonged exposure time to ground fire (5 to 10 mins) dictate that many ~~[illegible]~~ fire hits will continue to be received.

The type, number and tactics to be used in providing escort for low level aircraft flying over hostile territory is based on [illegible], airspeed and track to be flown by the low level aircraft.

In the case of the relatively slow flying (130 KTS) armed C-123 spray configured aircraft the fighter aircraft utilized for hostile fire suppression must be compatible in airspeed, highly maneuverable, and adequatley protected from ground fire. It must carry adequate weaponry and be able to provide maximum ground fire suppression.

The A-1 fighter isthe only aircraft in RVN, jet or conventional, that approaches the capabilities required to escort the C-123 spray aircraft. The A-1 has limitations; however, and it is these limitations that dictate the numbers of fighters to be used. Exposure time is based on the radius of action of the hostile ground fire, the altitude that an airframe will be subjected to ground fire, and by the speed and distance that it will remain below the minimum altitude. Hostile ground to air fire currently in Vietnam is such that the exposure altitude is 1500' above the terrain and in many cases higher (3,000 - 5,000'). As the VC obtain more modern weapons, quad 50 caliber machine guns and 37 MM anti aircraft weapons the exposure time will continue to increase. The C-123 sprays chemical for six minutes or 24 KM which requires eight minutes of exposure below 1500 feet and a 30 KM track.

The A-1 can maintain airspeed, maneuverability and ammunition for ground fire suppression for only 2 minutes of C-123 exposure time or 6 KM of exposure track. Since the tactic developed to support the exposed C-123 spray aircraft requires 2 A-1 fighters per 6 KM of exposure track, then it would require 8 A-1's to sustain 24 KM of C-123

spray track. In order to reduce the number of fighter sorties required to escort a mission, the spray track would be reduced to 12 kilometers and two C-123's employed. In addition to the eight escort aircraft, four more fighters would be required to conduct pre and post strikes on enemy gun positions. A total of 12 A-1's would be required to escort two C-123's over a 12 kilometer spray track.

The tactics used to provide adequate escort and the number required were developed by fighter pilots and Tacticians who have flown A-1's in support of the C-123 spray aircraft for the past year when most sorties were flown on a wide variety of targets. This has been a pioneering effort as previous experience did not exist in this type of operation.

Intelligence reports indicate that we can anticipate from moderate to intense 30 and 50 caliber ground fire in our ~~next~~ project, 2-23, in **Kontum Province. On this basis the following aircraft sorties will be required.**

KM of Low Level C-123 Track	C-123 Sorties	A-1 Sorties	O-1 Sorties	UTT Sorties	Med Evac Sorties
1,530	128	1,530	64	256	128

Four C-123's could complete the Kontum project in _____ days ~~operating without fighter support~~, if there were enough fighters to support all spray aircraft the project would take _____ days.

[illegible] consider is that crop destruction occurs in the crop growing season. The growing season most often occur during the rainy season which is associated with low ceilings and visibilities. The C-123 can operate with 300 foot ceilings and two mile visibility. The A-1's must have 1,000 feet and 4 miles in the mountains

and 3000 and three in the level areas for escort work. [illegible] number in Kontum Province in July and August will give these minimums [illegible] less than 20% of the time.

Additional weather factors that influence this operation are: temperature below 80°F, winds less than 6 knots, and no [illegible] for two hours after spraying. For the most part these make this an early daylight or late evening hour mission.

Night operations were tried with and without flare illumination and were found to be impractical. There is no way of discerning the edge of previously sprayed areas. Flying hazards associated with this mission are compounded by night operations.

All factors being considered the limiting factor in herbicide operations has shifted from the operation requirements of the C-123 to the availability and operating requirements of the A-1.

A-1 fighter sorties are much in demand in the RVN. ~~There are [illegible] VNAF A-1's. There [illegible] USAF A-1's.~~ VNAF support of this mission is questionable. There are difficulties in communications and coordinations that are an essential element of this operation. Reliability and discipline of VNAF forces make this solution tenuous at best. VNAF has no experience with some of the ordnance required on this mission. The experience level of the VNAF pilots dictate many training missions in a hostile environment. All of these problems topped off with some expressed reservations by the VNAF Director of the AOC make possible solution undesirable.

USAF A-1 aircraft are programmed at a 1.2 sorties per aircraft ratio. Of the 68 sorties available each day, 48 are alloted for VNAF

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training. The remaining 20 sorties are expended by the priority system. This system places escort missions in third priority. Experience indicates that very few A-1 fighter sorties can be made available on a continuing basis.

The ratio of ground fire hits received by defoliation aircraft are not necessarily to be equated on the amount of fighters used and their offensive escort capability against predetermined gun emplacements, but could be related to the security of operations, the element of surprise and the estimated numbers and types of hostile ground fire installations compared to the maximum fighters that can be flown within the allowable airspace.

Ground fire hits could be reduced if target planning security and the element of surprise could be maintained. The lack of security and element of surprise has been and is inherent in herbicide operations.

Target acquisition within the military structure in the RVN precludes security. An estimated ninety percent of all target security is lost when the target complex and free strike zones are obtained thru civil and military sections of the RVN district, provinces and corp agencies.

The element of surprise is negligible because of target planning security, the restrictive time periods of dispensing chemical and the manner in which the spray aircraft must fly the approach to the target and conduct subsequent operations inherent in herbicide operations.

To fly to the target at the lowest level subjects aircraft and crew to certain ground fire and when letting down to target from high non-exposure altitude (3 - 5,000) with a C-123, the aircraft itself provides ample early warning for expectant forces.

Once an area has been partially sprayed the enemy can determine the next track route, to be accomplished. Telltale evidence of the chemical dispensed is immediate and long lasting. There is no way to secure this evidence and the enemy has little difficulty in ascertaining subsequent flight tracks to be flown, the same day or succeeding days, when many flights must be made to complete a project or a series of projects.

The problems associated with herbicide operations in a hostile environment are many and complex. Much experience has been gained. Much has been accomplished. The potential shows many possibilities. The resources required to support this operation have increased to a point where total resources available cannot support this operation along with other daily combat requirements.

Fighter sortie priorities should be evaluated to include herbicide operations if this mission is to continue at the previous rate of operations. The high cost in fighter resources dicates a very close analysis of the purpose and relative merits of this operation.

It is recommended that the DOD Advanced Research Projects Agency conduct this analysis. It is understood that ARPA was involved in the initial herbicide program development. ARPA is currently studing herbicide techniques in a field study in Thailand. An analysis of the results of herbicide activities in RVN could conceivably be incorporated into the current Thailand study.

The aerial application of herbicide agents as an instrument of war is a new field of endeavor. Experience has been accumulated. Now is the time to collect, organize, collate and analyze this experience into hard, cold facts. These facts can then become the planning base for future application of this weapon system.

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