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Forensic Archeology and the Need for Flexible Excavation Strategies: A Case Study

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ABSTRACT: Anthropologists from the U.S. Army Central Identification Laboratory, Hawaii (CILHI) are routinely confronted with challenging situations when searching for the remains of American servicemen lost in armed conflicts. All CILHI anthropologists are well-versed and experienced in "textbook" archeological methods. As such, standard excavation techniques and procedures are the foundation for every CILHI recovery. Yet, the inherent nature of the CILHI missions prescribe excavation strategies that depart from those regularly presented in archeology textbooks. The unique nature and grand scale of the CILHI missions; environmental, physical, and geographic hazards; the salvage nature of the missions; time and budget constraints; and the inherent politically and emotionally charged atmospheres of the missions necessitate flexible excavation methods. For example, many CILHI recovery operations in Southeast Asia are excavations of large craters created by the impact of high-speed military aircraft in remote, unpopulated locales. In addition to rugged and dangerous terrain, an abundance of unexploded ordnance and poisonous reptiles and insects typically complicate excavations. These challenging circumstances dictate that the CILHI anthropologist constantly adapt conventional archeological techniques to unconventional excavation situations to maintain the crucial balance between maximum data recovery and scientific protocol.

KEYWORDS: forensic science, forensic archeology, forensic anthropology, Central Identification Laboratory Hawaii, recovery of human remains

Increasingly, law enforcement agencies are appreciating the unique and multifaceted contributions made by forensic anthropologists to the legal investigation of buried bodies and/or skeletal remains. All forensic anthropologists are trained in physical anthropology and most are familiar with the archeological methods utilized in the excavation of historic and prehistoric burials. In this regard, various authors (1–5) stress strict adherence to archeological excavation procedures for forensic cases. They emphasize excavation by standardized units and cultural, natural, and/or arbitrary levels, with meticulous recording of artifact provenience to maintain stringent horizontal and vertical controls.

Yet, as the experienced forensic anthropologist is well aware, forensic excavations require flexible, common sense, stream-lined approaches. Unlike many archeological projects and field school operations, rigid adherence to textbook archeology is not a viable option. Not all archeological techniques are appropriate for forensic investigations. Modified, flexible excavation strategies should be the norm rather than the exception. The nature of the forensic missions undertaken by the U.S. Army Central Identification Laboratory, Hawaii (CILHI) illustrates the need for a flexible approach in forensic archeology. This case study should serve as a cautionary tale to the less experienced forensic anthropologist and to others observing forensic recovery operations with expectations developed from textbooks.

Anthropologists employed by the CILHI supervise world-wide search and recovery missions for the remains of American servicemen lost in armed conflicts. In most CILHI operations the identity of the individual(s) involved is frequently known prior to excavation. Therefore, the goal of the CILHI is defined as full accounting, which is achieved through on-site witness interviews, aircraft wreckage and life-support equipment analysis, the recovery of remains, transportation of the remains to the CILHI laboratory, forensic identification of the remains, and return of the remains to relatives. While standard archeological procedures are the foundation for each and every CILHI recovery, circumstances do not always permit stylized adherence to textbook techniques. A variety of complicating factors, including heavily scavenged sites, unexploded ordnance, environmental and physical hazards, and time and budget constraints, require that conventional archeological procedures be adapted to unconventional circumstances.

CILHI standard operating procedures mirror those followed by forensic anthropologists and archeologists in the private sector. Every CILHI recovery begins with a survey of the project area. The CILHI anthropologist incorporates witness statements, previous investigative and casualty data reports, alterations to the landscape, and evidence distribution (personal effects, life-support equipment, aircraft wreckage) to determine the area most likely to contain human remains. After the excavation area has been defined and site preparation completed, the datum point is established and recorded using the Global Positioning System (GPS). The excavation grid is placed around the datum and excavation by gridded units commences. All removed fill is screened through .25 in. wire mesh for artifacts and remains. Provenience is recorded for all recovered items.

Any divergence in excavation strategies between 'typical' forensic anthropological sites and the CILHI sites is a direct correlate of the unique nature of the CILHI's missions. Currently, high-speed military aircraft crashes comprise the majority of the CILHI case load, with isolated burials the next most frequent category. The CILHI excavations are typically salvage operations that are complicated by extreme environmental (e.g., ordnance, aberrant temperatures, monsoons, typhoons, flooding, poisonous reptiles and insects), physical (e.g., the ever-present risk of fungal, parasitic, and infectious diseases, and unsanitary living conditions), and geographic (e.g., rugged mountainous terrain and dense jungle)

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hazards. Time and budget constraints, foreign government dictates, cultural barriers, and a politically and emotionally charged atmosphere exacerbate excavation conditions.[2]

With the exception of anthropologists working with some humanitarian missions, the combination of factors routinely faced by the CILHI anthropologists is seldom encountered by our colleagues in other contexts. For example, the author supervised the excavation of an isolated burial associated with a 1960s loss of an A1-E attack fighter bomber and its pilot. The site, located in remote, rugged, and undeveloped mountainous terrain southwest of Hanoi, Socialist Republic of Vietnam, was approachable only by helicopter. Several sorties out of Hanoi were required to transport 12 American Recovery Team members, 15 members of the Vietnamese Office for Seeking Missing Personnel (VNOSMP), and excavation and survival equipment to the project area. We established our landing zone/base camp in the only flat dry area available, the graveyard of an ethnic mountain tribe village. The project location was a three kilometer walk from the base camp across rice paddies, through a river, around a hamlet, and up a steep mountainside thick with vegetation. Trees shrouded in vines obscured the sun and dense undergrowth covered the ground. The crash site and associated burial were located on the side of a karst with an approximate 65 degree slope at an altitude of 5,800 feet above sea level.

Witnesses directed the team to the general burial location. An area measuring approximately 30 by 30 meters was cleared of vegetation, a difficult task in a lush tropical environment. During clearing and excavation, 14 banded kraites (snakes also known as "two-steppers"—after being bitten the individual takes two steps and drops dead), numerous scorpions, spiders, and other insects were dispatched. Live ordnance encountered included two 2.75 high-explosive rocket warheads—one of which was thrown to this anthropologist by a local worker unaware (or unconcerned) of the potential consequences—five cluster bombs, 33 rounds of 20 mm high explosive bullets, and four smoke canisters.

Personal effects and pilot-related life-support equipment located during the surface search, combined with witness information, suggested that the burial location lay within an 8-12 meter portion of the cleared area. The datum was established using the GPS and the area was divided into six 4-4 meter units. Between 20 and 50 cm of loose soil overlaid vertically faulted bedrock. This faulting exacerbated the dangers faced by excavating on the steep slope, and one was constantly conscious of the sheer vertical drop-off of over one mile. Footing was treacherous, walking across the site was laborious, maintaining balance during excavation was arduous, and standing erect was impossible. Cold driving rains and gusty winds contributed to less-than-ideal working conditions. In spite of the treacherous terrain, unexploded ordnance, and rain, the excavation was a success. Skeletal remains, personal effects, and life-support equipment were recovered and no one was injured. Subsequently, a positive identification of the remains was made at the CILHI. These conditions, typical of the CILHI recoveries currently underway in Southeast Asia, underscore the need for flexible excavation techniques to ensure team safety and a thorough recovery while maintaining archeological standards.

The CILHI anthropologists are comparable to historical archeologists in that they initiate site excavation armed with archival data. Because each CILHI recovery is carefully researched prior to mission deployment and the data is constantly checked and updated, the recovery team arrives at their project area with detailed knowledge of the incident. As a result, the circumstances surrounding the loss, type of aircraft, and individual(s) involved in the incident are known. Once in the field, the CILHI anthropologists conduct interview with witnesses for supplemental information. These factors differentiate the CILHI anthropologists from their contemporaries in forensic anthropology who, by necessity, typically conduct their work with little or no case-specific information. They are not afforded the "luxury" of prior knowledge concerning the circumstances leading to the incident, the incident itself, the post-event particulars, and the identity of the individual(s) involved. In such cases, meticulous attention to detail is required. The incremental removal of soil by controlled arbitrary levels, while maintaining strict three-dimensional control over the excavation to ensure the precise provenience of all material evidence (1–3, 5–7), is standard in forensic buried body cases. Because the CILHI anthropologists have detailed knowledge of the burial or crash site and of individuals involved prior to excavation, this attention to minute detail is frequently time-consuming and unnecessary. Minimally, a datum and excavation grid are established and gross provenience (by unit) is recorded.

In the recovery cited earlier, excavation proceeded by grid and general provenience was maintained for recovered remains and artifacts. Remains and artifacts were bagged by discrete units and transported to the CILHI with provenience retained during laboratory analysis. Generally, the precise three-dimensional relationship of artifacts to remains is not recorded for isolated burials. The CILHI anthropologists are not attempting to recreate a crime scene. In burials such as these there was neither the intentional placement of grave goods, nor the formal, ceremonial, or premeditated arrangement of material evidence. There is no "crime" or "crime scene" to reconstruct. There are no cultural levels, no chronology, and no extinct lifeways to interpret. The purpose of the excavation is to recover all remains and any associated artifacts, such as an identification tag or personal effects, for repatriation to the CILHI for laboratory analysis that may lead to an identification. To painstakingly record the spatial relationship of objects within the grave fill would provide little additional information to the CILHI identification process. Graves do not have stratigraphy, rather they represent an episode of back filling. Items recovered from the grave may indeed yield valuable information to the identity of the buried individual. But it is the artifact itself (such as identification media, wedding ring, or aircraft data plate) that will furnish the clues, not its exact location.

There are, of course, complex situations where three-dimensional control of artifact provenience is required. For example, without such control it would be impossible to reconstruct the sequence of events in a mass grave with bodies superimposed over one another with shell casings and wadding scattered in, around, or between bodies.

As with isolated burials, the CILHI anthropologist arrives at an aircraft crash site with detailed knowledge of the circumstances, type of aircraft, and specific individuals to be recovered. Therefore, the amount and distribution of artifacts, remains, and wreckage offers little, if anything, toward case resolution. What is important in the recovery of an aircraft loss or isolated burial, is any associated artifact that can be correlated to aircraft model and the presence or absence of life-support equipment.[3] The precise spatial

[2] As many CILHI missions are conducted in isolated areas, the recovery team often represents the first exogenous contact for many indigenous Southeast Asian populations, particularly those individuals born after the Vietnam War.

[3] Narrowing the identification of aircraft involved, from type to model, binds the correlation between archival reports and physical evidence and aids the identification process. Recovery of life-support equipment indicates that crew members were on board the aircraft at time of impact.

location of these items in the crater is not relevant. Several factors contribute to this condition. The first factor is size. Whether the aircraft has impacted a mountainside, rice paddy, or level ground, one factor is constant—the daunting magnitude of the impact crater. This author has supervised the excavation of aircraft crash impact craters that have ranged in dimensions from 20-30-7.5 meters (in a rice paddy) to 15-25-32 meters (on a mountainside). The size of and excavation strategies for the impact craters makes it impractical, counterproductive, and virtually impossible to record, other than by unit, each fragment of aircraft wreckage, human remains, or personal effects.

The second factor is post-event interval. Environmental forces and human intervention over the past 30 years mean that little identifiable or recognizable aircraft wreckage remains at the majority of sites. Usually the only indication that such an event occurred is the alteration in landscape from impact. In most regions of Southeast Asia, crash sites have been scavenged extensively. Local peoples have utilized the wreckage for a multitude of utilitarian items, including tools (knives, hoes, machetes), building materials (walls, roofs, floors, furniture), cooking implements (pots, pans, utensils), and storage containers. The wreckage that the CILHI recovery teams most frequently encounter is limited to aircraft fragments that were too small to be of any other practical use, oxidized aluminum, or large parts, such as engines, that were too heavy or cumbersome to remove from the area.

The third limiting factor is allocated recovery time. Each CILHI recovery team is in the host country for approximately 30 days. Part of this time is spent coordinating recovery efforts, locating and interviewing witnesses, gathering equipment, arranging transportation to the site, and, if necessary, establishing a base camp. Frequently an aircraft crash crater is only one of a number of sites that the team will excavate during a mission. Thus, recovery time is very limited. Because these excavations must proceed with expediency, achieving the delicate balance between scientific procedures, optimal data recovery, and timely closure of the site is often the most difficult challenge faced by the CILHI anthropologist in the field.

The CILHI anthropologists have developed a basic excavation strategy that meets these demands without adding unwarranted complexity or sacrificing data. Before any excavation begins, the joint recovery team visits the site to estimate recovery time and size of labor force needed. An excavation strategy is formulated, final preparations are made, and cultural and social obligations are met. As the magnitude of an aircraft crash crater requires a large work force, up to 200 indigenous laborers may be hired. Before excavation of an aircraft crash impact crater, a metal detector is used to locate wreckage scatter outside the crater. If the type and concentration of wreckage warrants further investigation, then the excavation area is expanded beyond the crater's limits. Impact craters can be virtually sterile or artifact-rich. Generally, sterile impact craters were relatively accessible to indigenous populations and were heavily scavenged. Artifact-rich craters are typically located in inaccessible areas, such as in a cultivated rice paddy, a stream or riverbed, or remote jungle.

The datum is established and a "hanging" grid is placed.[4] The walls of the crater are cleared of vegetation and loose soil using pick axes and shovels. All fill is placed into buckets and transported by laborers to a screening area. In an ideal situation, direction of excavation will be dictated by the trajectory/angle of aircraft impact. As one would expect, artifact distribution will mirror direction and mode of impact. For example, if the aircraft impacted the ground nose first, a large deep crater is formed with the majority of wreckage, life-support equipment, and remains located at the lower depths of the crater. If the aircraft "bellied" in and impacted the ground on a horizontal plane, then the majority of artifacts will scatter in a basically forward direction, frequently covering a great distance. Excavation proceeds by unit with gross provenience recorded for recovered items. Excavation continues as long as aircraft wreckage identifiable by type and/or model, life-support equipment, personal effects, and/or remains are encountered. Recovered artifacts and remains are handled in the same manner as those recovered from an isolated burial.

Undoubtedly, the vast majority of forensic anthropologists adhere to the laws of superimposition that state that "(1) if soil layer A covers soil layer B, B was deposited first, and (2) each level or stratum is dated to a time after that of manufacture of the most recent artifact found in it" [8:68]. Stoutamire echoes these principles for buried body cases when he states that "any items found under the body had to be placed there prior to placing the body in the grave" [5:36]. These standards do not apply in situations typically encountered by the CILHI anthropologist. The most obvious example involves the excavation of an aircraft crash site or crater. When a high-speed aircraft impacts the ground, wreckage is not neatly distributed with respect to the laws of superimposition. In addition, three decades of looting and scavenging negates any patterning that may have existed.

The great majority of forensic cases categorized as surface finds are skeletonized remains that have typically been scattered by natural forces and/or carnivore activity. Many forensic anthropologists handle the recovery of all surface finds as they would any archeological discovery. They establish a datum point and grid system to ensure systematic recovery of materials. Painstaking documentation of the exact location of skeletal remains and objects is used to facilitate crime scene reconstruction and individual identification. Indeed, the "spatial distribution of bones, teeth, and other items recovered in surface finds can help in determining the original location and position of the body" [9:118]. Detailed and meticulous recording of artifact provenience is particularly useful in the recovery of a mass disaster when a grid and distance and direction of scattered remains from datum will help explain and document perimortem and postmortem events.

Although the methods used to recover scattered remains are consistent, in reality there is no one all-encompassing search pattern. Each set of scattered remains represents a unique episode and must be handled as such—with flexible and adaptive recovery techniques. This is especially pertinent when surface finds believed to be associated with an isolated burial or air crash are encountered by the CILHI anthropologist. Given the nature of the incident and elapsed time, if any scattered remains exist, they have been subjected to almost three decades of erosion. In isolated burial recoveries, surface finds reflect little more than the most likely point to initiate excavation. But, there are times when this assumption is not valid. We know that the remains of American servicemen were frequently disinterred from their original burial area and reburied in a different location or "warehoused" by the Vietnamese government. Scattered remains encountered while surveying an aircraft crash are frequently just that—scattered. Often, when a high-speed military aircraft impacts the ground, exploded materials are distributed in all directions over a large distance. Human remains associated with this type of episode are very fragmented, small, and

[4]A 'hanging' excavation grid is established on ground surface and encompasses the crater. Units are strung across the open crater and plumb bobs are used to maintain unit provenience.

usually burned and/or calcined. Thirty years of environmental disturbances and human and carnivore scavenging make it virtually impossible to reconstruct angle of impact and trajectory. Thus, recovered artifacts are documented by general provenience. In rare circumstances when intact aircraft with remains are encountered, meticulous gridding, mapping, and recording of all phases of site excavation are the norm.

These remarks should not be misconstrued as an attempt by the CILHI anthropologists to disregard archeological methods. Indeed, archeological procedure has a definite and significant role to play in all forensic recoveries. However, while the nature of some forensic cases may require strict spatial control over material evidence, many others do not. In either circumstance, the major focus of forensic recoveries should be the comprehensive and exhaustive recovery of evidence. Archeological methods, such as screening techniques, can ensure optimal control over and retrieval of evidence. However, to adhere stringently to the principle that the "excavation of a [forensic] site must be done according to archaeological procedures" [3:44], views forensic recovery as inflexible ritual. Much like individuals in Cultural Resource Management and forensic anthropologists involved in humanitarian missions, the CILHI anthropologists must constantly modify standard archeological techniques and implement flexible recovery strategies to fulfill mission requirements, cope with mission intricacies, and insure maximum collection of data and evidence, while eliminating irrelevant and time-consuming archeological procedures. Each forensic recovery is unique and presents original challenges to the forensic anthropologist to adapt archeological methods to the distinctive requirements of each situation. Flexibility and common sense in modified forensic recoveries must be the standard and not the exception.

As the demand for the services of forensic anthropologists continues to grow, it becomes increasingly important to develop methods and attitudes to advance the science of forensic anthropology and meet these demands practically and efficiently. It is essential that the forensic anthropologist adapt textbook archeological excavation techniques to site- and context-specific problems. Common sense in recovery strategies is not a tradeoff for efficiency, professionalism, or proper scientific procedure.

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