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Excavation of a Vietnam-Era Aircraft Crash Site: Use of Cross-Cultural Understanding and Dual Forensic Recovery Methods

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ABSTRACT: The excavation of a 23 year-old aircraft crash site in the Socialist Republic of Vietnam and the transformational processes preceding its excavation in 1995–1996 are detailed. The history of the site involved an initial catastrophic event, with subsequent reclamation and disturbances. Ultimately, a recovery effort by a joint U.S. team from the Central Identification Laboratory, Hawaii (CILHI), Joint Task Force-Full Accounting (JTF-FA) and a Socialist Republic of Vietnam contingent yielded numerous human remains, personal effects, and life-support items from the crash site.

This case study should be of interest to the increasing number of forensic anthropologists who carry out work in international contexts. The application of forensic anthropology in human rights abuse cases, for example in Rwanda, Argentina, and Bosnia, provide examples of such cross-cultural endeavors.

Cultural factors act in the development of a site and should not be overlooked as significant taphonomic agents. The approach that an indigenous person takes to a crash site or mass grave may be quite different from our own approach, involving Western science. Holland, Anderson, and Mann (1) describe the postmortem alteration of exhumed and/or curated bone caused by indigenous Southeast Asian peoples; the examples provided by these authors demonstrate how culture affects the treatment of what we would call "evidence." The international nature of an incident can add complicating "filters" to the reconstruction of events, since reclamation responses by indigenous people vary according to their interpretations of the scene. An investigating forensic anthropologist needs to understand the *emic* viewpoint (the insider's view), as cultural anthropologists do, when attempting to recover and reconstruct such an incident.

In response to the cultural (and natural) taphonomic agents at work on such a site, the use of dual forensic recovery methods—simultaneously treating the investigation scene like an aircraft crash and a clandestine burial site—is advised. Employing a flexible set of methods will allow for maximal recovery of evidence.

KEYWORDS: forensic science, forensic anthropology, *emic* viewpoint, dual methods, human remains recovery

Forensic anthropologists commonly deal with the unpleasant, yet necessary, task of recovering human remains from very recent aircraft crashes (2–4). Usually, this involves recovery of remains on the ground surface. Forensic anthropologists employed by the U.S. Army Central Identification Laboratory in Hawaii (CILHI), on the other hand, frequently excavate aircraft crash sites that have been subjected to various transformational processes for decades. Many of the excavations take place in Southeast Asia (Vietnam, Laos, and Cambodia), yet World War II era crash sites have been excavated by CILHI anthropologists in places such as Palau, Papua New Guinea, Europe, China, and Russia. Thus, they often find evidence that has been tampered with, moved, or is incomplete due to scavenging activities and other taphonomic forces. In addition, the remains are often buried due to cultural and natural processes. Thus, the CILHI recoveries must incorporate methods common to both burial recovery and aircraft crash recovery.

Since CILHI investigations usually occur outside of the United States, they require an *emic* (insider's, or indigenous) understanding of the events which occurred at the site in the past, and the factors that have transformed it into its present state. Potential questions to be asked are: how did indigenous people interpret the site? How did these indigenous interpretations affect their treatment of the scene and its contents? The forensic anthropologist must employ the perspective of a cultural anthropologist in such circumstances, and attempt to see things through local eyes. The historical context, involving the economic and political climate at the time of the event, clearly must be understood as well, since these overarching factors strongly affect the viewpoints of the people of any culture.

Detailed below is an excavation of a 23-year-old crash site in North Vietnam. The purpose of this study is twofold: (1) to detail the recovery of the crash site and to discuss the dual forensic methods used, and (2) to explore the cultural (and natural) variables that affected the development of the site. This information can be used by forensic anthropologists dealing with international incident scenes which have been subjected to the passage of time and concomitant cultural (and natural) transformations.

Background

CILHI and JTF-FA recoveries of crash sites are headed by a forensic anthropologist and focus on three main objectives: (1) to identify the aircraft, (2) to recover any associated human remains, and (3) to recover any evidence—such as life-support equipment and personal effects—that demonstrates that occupant(s) were in the aircraft at the time of the crash. (Life-support equipment in this case means any equipment designed to keep a servicemember alive, such as a survival kit, parachute, oxygen hose, ejection seat, etc.) This particular case involved a purported aircraft crash site in North Vietnam. The U.S. bomber was lost near the capital city of Hanoi during the well known 1972 "Christmas bombings." After unloading its ordnance, the bomber had been hit by a surface-to-air missile (SAM) and had consequently crashed and burned.

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Four members of the six-man crew were able to exit the aircraft prior to impact. They were captured and later released. Two men remained unaccounted for.

Methods

The CILHI and JTF-FA team arrived at the site in the fall of 1995 to interview eyewitnesses to the incident and to conduct an initial site survey. Two witnesses (both elderly men) described similar versions of the shootdown. Both men recounted being awakened during the early morning hours on a day in December 1972 by a SAM strike on a bomber which flew overhead. As they watched, the flaming plane finally began to disintegrate in the air. A very large fragment fell from the sky, in a west-to-east direction, and came to rest in the nearby fields. Four men were seen parachuting from the plane and were later captured. The fields were covered with wreckage, some remains, and fuel, which burned for the duration of the ensuing day.

The two witnesses then led members of the CILHI team to a nearby pond which was purportedly the final location of the aircraft, or the large portion of it. Witnesses and Vietnamese officials mentioned that a large piece of aircraft fuselage from the downed plane had been photographed and carried to the military museum in Hanoi not long after the incident. This photograph was not available to the team in 1995–1996. With interviews, the team was unable to establish whether this was the only piece of wreckage associated with the incident or if more remained to be found with excavation. The question could only be answered with excavation.

The pond measured approximately 50 meters (east-west) by 16 meters (north-south). The central portion of the pond had a distinctly round perimeter, while the east and west sides were extended and squared off, giving the pond a keyhole-like shape. Local informants mentioned that the pond had been extended on both east and west ends through the years, to facilitate traditional irrigation of nearby fields. The water that filled the pond was shallow according to the informants; they gestured that it was only waist deep (about one meter maximum).

The pond was said to contain many fish, which were named (among the locals) after the type of bomber which crashed there. Even this folklore can be considered evidence that the pond actually was the site of a crash in the past.

Surrounding the pond on all sides were agricultural fields. Rice is the main crop harvested here, but other plant varieties include water potato, Japanese hyacinth, cabbage, and watercress. Short feeder canals had been dug from the pond to bring the water nearer to the planting surfaces. A raised berm of approximately 20–25 centimeters surrounded the pond and was especially pronounced on the eastern half, where it formed a distinct curvilinear boundary. Figure 1 shows the fish pond and the adjacent farmland.

While surveying the area surrounding the pond, members of the team observed various small pieces of aircraft wreckage, such as copper wires with attached insulation material, black rubber fragments, and bits of fuel-bladder insulation. Given the witness statements and physical evidence, there was little doubt that this was the site of a previous aircraft crash.

With information provided by eyewitnesses, locals, and Vietnamese officials, it was clear that the cross-cultural nature of this event led to multiple interpretations of the crash site. To the Americans at home in 1972 (and thereafter) as well as the American recovery team presently on site, the aircraft and its personnel were lost. To the Vietnamese farmers and villagers who lived near the

FIG. 1—*View of alleged crash site upon initial survey. Notice distinct round shape of the center of the pond.*

crash site, there were at least three interpretations of the assemblage: (1) some of the items were useful, such as the high-quality metal and wire and the weapons carried by the servicemen; (2) some of the items were harmful, such as the fuel flooding the productive fields and the possible unexploded ordnance which might have been present; and (3) some of the items were/are interesting/curious, such as some of the equipment and personal effects carried by the crew members. At least one type of item had a dual nature, i.e., the remains of the crew members who died in the crash. To the Vietnamese, these remains may have been perceived as interesting (some Vietnamese had never seen a Caucasian prior to the war, for example) and at the same time harmful (rotting flesh may be contaminating to the surrounding environment/people and should be disposed of and/or covered up). The various interpretations of the site and its contents led to a number of different reclamation and site transformation processes, discussed below. Due to the cultural differences (including the political climate), the Vietnamese responded to the crash site in ways that contrasted to the later American treatment of the site. This different treatment, in turn, influenced the type of methods utilized in the recovery operation.

It should be added here that the actual process of interviewing witnesses (done with the assistance of JTF-FA interpreters) requires a relativistic approach, as well. Directionality, distances, approximate times of incidents, etc., are subject of interpretation, often depending on your cultural viewpoint. For example, the U.S. concept of the word "far" may be quite different from the Vietnamese concept. In addition, the passage of time clearly has an effect on the memories of eyewitnesses so approximations must be accepted in interviews that occur 20+ years after the fact.

Initial Excavation

Prior to excavation it was necessary to drain all surface water from the pond. This was accomplished in approximately two hours utilizing three standard water pumps. The water was pumped into a nearby canal. Fish were netted and removed by local villagers. The result of the drainage can be seen in Fig. 2. The substrate of the pond was a grayish-brown soft, silty mud. The witness reports had been accurate—the pond was slightly less than one meter deep at its maximum depth.

FIG. 2—*View of pond after draining of water.*

A surface survey of the mud layer of the pond was conducted. A metal detector was used to locate any signals that might indicate underlying ordnance or wreckage. Pin flags were used to mark any metal "hits." The concentration of hits was focused in the center of the pond. A metal detector search is recommended in both surface and buried body recoveries (5) to account for all evidence associated with the scene.

Next, screening stations were set up near a large canal so that water could be used in the screening process. Screens are standard equipment and water screening is highly recommended with buried body recoveries (5). This technique is also helpful in screening wet, muddy soil that would be difficult or impossible to sieve through a dry screen. The stations consisted of rectangular wooden frames (approximately 1.0 × 0.5 meter in dimension) with a one-quarter inch wire mesh base, aligned along a bamboo framework with hoses attached at various points to the support structure. The hoses supply water to the screens which allows the muck to be broken up and the remains/evidence to remain in the screen while being cleaned of surrounding soil matrix. With wet, muddy sites, CILHI recovery teams utilize this method so that any remains/pieces of evidence are not damaged, and for the screening process to be carried out efficiently/expeditiously. Figure 3 shows a section of screening stations used during this project.

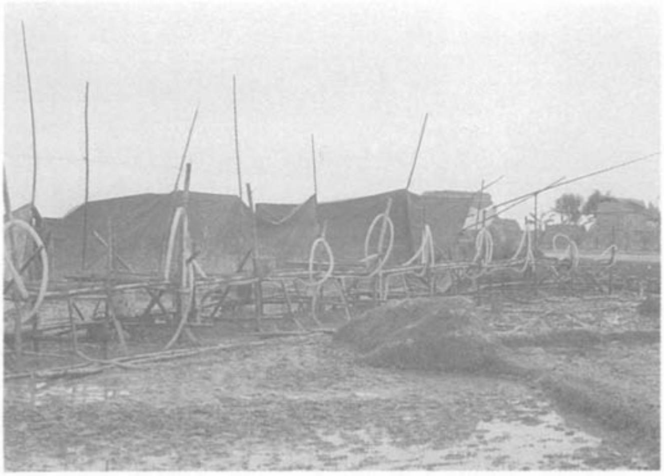

FIG. 3—*Section of screening stations.*

Prior to excavation, a grid was established in order to control for provenience of items recovered. This is a standard practice used by forensic investigators involved in recovery of recent aircraft crash sites (3,4). Placing stakes in locations where finds are situated is a variation on this procedure (6). Since this site was still quite moist, a "hanging" grid was set up. Strings that provided boundary markings for individual units and the overall site perimeter were suspended over the site and attached to stakes planted in the hard soil of the surrounding fields. Internal unit designations were established with the aid of plumb bobs. While the grid was being established, a piece of life-support equipment—a fragment of webbing from the torso harness of the parachute—was observed in one of the units within the western portion of the pond. This was a powerful indicator that human remains might still be located at this site.

Brightly-colored survey tape was strung around the entire site area, including the screening stations, for crowd control. As with recent aircraft crash scenes (7), security is a real concern. Local villagers were hired to guard the site when the team was not present.

The silty mud comprising the pond base was scooped and shovelled into buckets and passed to the screening stations. With aircraft crash recoveries, in contrast to traditional archaeological excavations, strata are oftentimes relatively gross in scale and have little to no internal differentiation. Thus shovels and picks are frequently used to remove overburden, with precision tools brought out when disturbances or foreign objects are detected in the soil.

Oftentimes probes ("T" or coring) can assist in the detection and definition of buried crash sites. This is a technique commonly used by forensic anthropologists and archaeologists in locating burials (8). As with burial detection, the probe can yield much information about a crash site in a short period of time. First, the core sampling can demonstrate aircraft wreckage fragments (e.g., wires, small fragments of fuselage, pieces of rubber, etc.) as well as soil changes. A series of such samplings shows where wreckage is concentrated in a site. The area of wreckage concentration is often the focus of such recovery efforts, since important evidence is more likely to be found here. Second, sterile soil can be detected with the use of a coring probe, thus allowing the anthropologist to determine the vertical limits of excavation. Areas surrounding the apparent site also should be probed, since the horizontal limits must also be established. The probe was utilized at this site to assist in all of these determinations.

In certain instances the use of a probe may be impractical (e.g., when large pieces of wreckage are present). But in the majority of cases in Vietnam, small fragments of wreckage are all that remain at the site, due to the continuous scavenging of large, obvious items.

The process of removing the muddy pond base continued for approximately one week with no human remains being recovered. Numerous fragments of life-support material (e.g., parachute, oxygen hose) were found, and it seemed likely that there would be human bone fragments remaining in the soil.

As the work progressed, the now waterless pond bottom became increasingly difficult to excavate and screen due to exposure to the air and sun. A solution to this problem came from a local woman who appeared on the site one morning with a brick-cutting tool. The U-shaped device (resembling a large cheese cutter) was basically a large metal handle (one grips the base of the U) with a thick piece of wire stretched across the open end. The wielder plunges the wire end into the soil, turns the handle about 90 degrees, and pulls up with the handle. The result is a neat block of soil which separates from the surrounding matrix. Once this method was demonstrated to the author and other team members, it became the only way to excavate this site. Cooperation between the members of two cultures facilitated the excavation throughout its course.

With continued excavation, three major strata were revealed. The initial layer of muddy soil varied in depth, ranging between 25 centimeters (at the sides of the pond) to one meter (in the central portion of the pond).

Beneath this mud stratum was a harder, dense clay layer with a reddish brown hue. The coloration was not consistent, but rather exhibited large mottlings of white, yellow, and deep purple. This is an indicator of recent (or in this case, not-so-recent) disturbance. In searching for buried bodies, forensic investigators note disturbed soil as an outstanding indication of a concealed burial (9). It is a useful feature to note in buried aircraft crash sites as well.

This mixed soil layer was more difficult to excavate, even using the local brick-cutting tool. Yet in this clay layer, the density of wreckage and life support increased noticeably.

On the eighth day of excavation, the first human bone fragment was recovered from within this mixed clay stratum. Related personal effects were also found on this day. The recovery team had a renewed sense of direction as work continued.

After approximately 24 days of excavation, and at a depth of approximately 2.5 meters, numerous human bone fragments, pieces of life-support equipment, and personal effects had been recovered from the crash site. The sterile bottom of the pond/crater had not yet been reached in any excavation area. A test pit was dug and a series of probe core-samplings were taken in order to define where sterile soil lay below the pond fill. At approximately 3.5 meters below the surface, in the central area, pure, grayish white sterile clay was encountered. This layer represented the third and final stratum of the site.

During the course of the excavation, the team tested the entire site for content. Five 1-X-1 meter test pits were dug and probe samplings were taken in various portions of the unexcavated pond fill. All test pits contained varying amounts of wreckage, and 3 out of the 5 contained fragmentary human remains. The test pits were widely-spaced, i.e., 10 to 15 meters apart (see Fig. 4). Core samples were taken in between test pits and on the extreme outer limits surrounding the site. The conclusion drawn was that virtually all areas of the site had to be excavated down to sterile soil. The wide dispersion and lack of patterning of remains could be explained by the nature of the crash (7) and the developmental processes that had affected the site.

FIG. 4—*View of drained site after test pits and probes revealed wide distribution of remains.*

Due to time constraints, work ceased on the site in November 1995. The project area was re-filled with water, in order to protect it from scavenging activity and the effects of weathering. An augmented recovery team would return to this site in January 1996 to complete the excavation.

Excavation Continues and Intensifies

The team returned to the crash site as scheduled, and immediately re-established the screening stations and re-drained the pond. The site had suffered little disturbance in the intervening months; the only noticeable difference was the wall slump which had fallen in the previously excavated areas. Work progressed at a rapid and steady pace, since the team was familiar with the proper tools, water supply, screener-to-excavator ratio, etc. Human remains, life-support items, and personal effects continued to come from the clay layer. An important piece of aircraft wreckage was found soon after the re-opening of the site—a large fragment of fiberglass bearing the aircraft number associated with the loss being investigated. This evidence tied the site positively to the specific bomber aircraft lost in 1972.

The most intensive period of work came towards the end of the project (as is typical with most archaeological sites that the author has worked on prior to this). A large piece of wreckage had been uncovered during excavation, approximately 2 meters below the pond base in the center of the site. This evidence appeared to corroborate the statements given by the two witnesses. The excavators were instructed to continue to dig vertically in this area since it was obvious that sterile soil had not been reached here. Soon thereafter, a piece of parachute material was encountered which was tightly twisted around the long metal piece. The excavated area surrounding these artifacts was expanded vertically and horizontally. The depth of the metal piece and the parachute continued for approximately 2 meters and a concentration of human bone and life-support items was encountered. The culmination of this week-long intensive recovery effort was the discovery of two teeth with restorations, a dental prosthesis, numerous bone fragments, and an intact survival vest with a variety of personal effects in the pockets. The entire team was moved by these finds, since they served as grim reminders of the personal side of the lost servicemens' lives some 23 years ago. Undoubtedly, similar emotions are felt by those involved in recent aircraft crash site recovery operations.

These important finds were recovered in a logistically difficult situation. The area surrounding the wreckage piece (which turned out to be a large portion of the tail of the aircraft) and parachute was expanded to be approximately 1.7 meters in diameter and approximately 1.7 meters in depth. Four natural springs had opened into this subarea and the team had to create sump zones in order to pump out the rapidly flowing water. Walls from the main excavation area towered up to seven meters, and cracks in these walls were formed, despite efforts to reinforce them with bamboo. With the combination of work hazards, the recovery ceased when it was determined that the majority of evidence had been recovered from this particular location and that any further excavation would jeopardize the safety of the team members. A visual assessment/inspection of the baulk walls for content revealed no remains, life-support items, or personal effects.

Work also continued in the test pit areas of the previous excavation and more evidence was recovered from these locales. At site

FIG. 5—*Overall view of site after excavation, facing east.*

closure, the entire pond had been tested for content and excavated to its culturally sterile limits (i.e., soil with no cultural content—wreckage, life support, remains). The final dimensions of the excavation area were 25 meters (east-west) by 10 meters (north-south) by 2 to 7 meters in depth. Figures 5 and 6 show the overall view of the site after excavation was complete.

Results

Combining forensic recovery techniques for both aircraft investigations and buried bodies, the recovery of this site produced valuable evidence that could answer questions that had been asked for over two decades. The analysis of the strata and evidence also allowed insight into the cultural (and natural) processes which formed the site, detailed below.

Reclamation and Disturbance Processes

Excavation of the site revealed that the initial impact crater contained wreckage, life-support equipment, and remains. At the moment of impact, the aircraft and its personnel were considered lost to the American side. Yet to the Vietnamese people whose fields were burning, the site was a place with items that were useful, harmful, and/or interesting. They responded to these three qualities in various ways.

FIG. 6—*Overall view of site after excavation, facing west.*

The attraction of metal and other useful items led to the first post-depositional stage in the crash site's history, i.e., reclamation by local villagers. The reclamation process is the transition of cultural material from the archaeological (deposited) context, back into the social context (10)—an activity referred to in layman's terms as scavenging. Archaeologists know that this is not a situation limited to items on crash sites; many artifacts are deposited and then reclaimed by others and put back into use (for example, a projectile point is found and resharpened for use, or an old brick is used in a new fireplace (10)).

Almost every aircraft crash site that CILHI anthropologists encounter in Vietnam has been heavily reclaimed by people in need of metal, wire, and any other item that they can put to use. This activity is not limited to Southeast Asian aircrash sites. A CILHI team recovering a WWII-era B-24 crash in Oregon reported that witnesses had visited the site and removed utilitarian objects (e.g., metal, guns) from the wreckage. Likewise, during World War II in Germany, the German war machine collected the wreckage of downed aircraft to melt down for later re-use in the war effort.

The items removed from a crash site do not have to be useful to the scavengers; mementos or souvenirs are taken in many cases. Life-support items such as strobe lights, parachute fragments, and the like are commonly reported as having been kept in villagers' households years after the incident. Oftentimes the villagers can produce these items to show the anthropologists, demonstrating that these items are curated in certain cases. If for no other reason, people are curious about such happenings in their local area, and, as we are all well aware, aircraft crashes amount to "big news" in remote "third world" regions as well as urbanized, industrialized environments. Dimaio and Dimaio (7) refer to the presence of souvenir hunters and looters on scenes of commercial plane disasters in the U.S.

At this particular crash site, the Vietnamese villagers also had to contend with aspects of the site that were harmful. Both central government officials and local villagers were concerned with the fuel that had been spilled over a vast expanse of agricultural land. Large pieces of wreckage lay at the base of the crater caused by the impact of the disabled aircraft, yet these potentially useful items were never removed by locals, since the possibility of further damaging the fields with fuel was great. Thus, to avert even more harm to the land and to restore it to its original productive state as quickly as possible, some metal and other useful items were ignored. This activity resulted in preservation of important evidence recovered by the 1995–1996 forensic team.

A person's presence at a site has various effects on the preservation of evidence and site integrity. Scavengers remove items that could be used as evidence by a forensic team. The movement of people and animals through time over the surface of the site will also alter the landscape, compacting of the strata and possibly destroying evidence. This is also a consideration with buried bodies (9). Furthermore, even the simple acts of walking and climbing on/at a site may disturb evidence and move it from its original position. Thus, reconstruction of the circumstances of the event is made more difficult (11).

Specifically, the job of reconstructing the events of the crash is that of both the JTF-FA life-support technician and the anthropologist on site. The life-support technician is trained to identify life-support items in a fragmentary state, as well as reconstruct the crash event, if possible. The Life Sciences Equipment Laboratory

(LSEL) in San Antonio, Texas, also analyzes life-support equipment in great detail in order to address questions involving the pilot's (and other crewmembers') fate(s). Of course, if wreckage and/or life support is moved from its original position after impact, then this job will become quite difficult and even impossible.

Once useful and/or interesting items are removed from a crash site, the re-establishment of productive land often takes place. In forensic/archaeological terms, this would be considered a disturbance process, since evidence is being obscured and/or moved from its original position, making the reconstruction of events more difficult. If an aircraft crash took place in a very remote area, such disturbance may not happen. Yet, in areas similar to the above-mentioned site, with agricultural fields surrounding the crater, locals and governing officials are eager to get their productive land back into working order. With aircraft impact craters, the disturbance process frequently involves backfilling with nearby soil. In cases such as the one discussed here, this soil is often composed of berm (a layer of soil that had been built up from the creation of the crater) and a layer of backdirt derived from the reclamation of metal and other items by local villagers.

In the present case, excavation and follow-up interviews with local villagers and government officials revealed that the second stratigraphic layer (the mottled clay layer) represented the backfill that locals had put in the aircrash impact crater. The backfill layer had a variety of colors since it was not a pure, naturally-derived stratum; rather it was the result of a series of unnatural, human-produced events. The majority of the fill was composed of soil which had been blown from the crater upon impact (i.e., the berm) and from subsequent digging activities by locals.

As mentioned previously, this situation can be compared to that of a backfilled burial (9:11). This soil will often contain pieces of important evidence which have become decontextualized from the original, *in situ*, position.

Not only do locals backfill craters but often they will tamp down the surface or flatten out the overall surrounding area. Obviously, this facilitates easy plowing and cultivation of the agricultural land. Also, if a structure is to be built in the area, level ground is necessitated. As with burials (9), this disturbance to the surface can make it difficult to determine the location of a crash site.

If craters are not backfilled, they are often filled with water (or become naturally filled by springs). In the case of the crash in this case study, both transformations occurred, i.e., soil backfilling and water filling. The cultural processes of flooding the site and irrigating near a site, and the natural processes of run-off and erosion led to the development of the first stratum that the team encountered, i.e., the fine, silty mud. Many fishponds used by the Vietnamese today are transformed bomb craters or aircrash craters (personal observation). All of these above-mentioned processes can be considered further disturbances that affect the site.

The tamping, or leveling-off, process will result in the destruction of visual surface evidence of the crash site. The overall contour of the land is changed and many times no sign of a crater will be left. The author surveyed one crash site in a rice field where witnesses stated that they knew where the crash had occurred because the soil there produced differences in the rice plants growing in that particular microenvironment. No sign of any crater or wreckage was observable on surface inspection. Thus, probe samplings, test pits, detailed surface searches, and interviews with locals—with consideration of plant forms as well as soil types and topography—are required if no obvious sign of a crater can be seen. The same method for detailed surface search has been suggested for forensic recovery of clandestine burials (9,12).

Backfilling, purposive flooding, and leveling are cultural factors which affect site integrity. Once buried, the evidence is subjected to numerous non-cultural (natural) transformation processes. Overlying soil and water cause pressure that will further degrade evidence in some cases. From the surrounding matrices, water can erode any material given enough time, and the pH of the soil has a major impact on the degree of preservation of the evidence. If soil is acidic, there will be a high probability that much evidence will be degraded and perhaps completely disintegrated. Insects, earthworms, and rodents will also speed along the degradation process (13).

Ironically, the burial of the crash site by backfilling and/or purposive flooding may also preserve evidence. First, it is protected from the elements and also from the potential scavengers' purview. Second, the jet fuel contained in the soil appears to have a preservative effect on remains (personal observation).

Discussion

The preceding paragraphs detail an international aircraft crash incident, the simultaneous use of forensic recovery techniques usually applied to concealed burials and aircraft crashes, and the various cultural and natural agents which transformed the site through the years following the event. For aircraft crash sites that have not been immediately recovered, cultural and natural transformations, including reclamation, backfilling, purposeful flooding, leveling, erosion, run off, and other taphonomic factors will alter the incident scene and make reconstruction of events and recovery of evidence more difficult. Cross-cultural understandings are necessary to get a complete picture of what transpired at the site through the years. Responses vary with different interpretations of the scene and its contents. Clearly, human activities are significant taphonomic agents that influence site formation and site contents. As mentioned earlier, Holland, Anderson, and Mann (1) document the human variables that affect postmortem alteration of human bone, demonstrating that differences in cultural attitudes and viewpoints have an effect on remains that are not *in situ*, as well.

One can consider the joint forensic recovery operation as an additional reclamation response to the site, guided by the Western concept of science. Careful excavation with detailed recordation of evidence found and provenience thereof, following the basic tenets of the scientific method, is the "appropriate" response, from our cultural viewpoint.

Following the scientific concept, the author found that the synchronous treatment of the site, as a burial and as an aircraft crash site, permitted the reclamation processes to be reconstructed. For any forensic scientist involved in investigation (or re-investigation) of a scene which has been affected by similar processes and/or the passage of time, these dual methods should be employed. (Previously recovered aircraft crash sites are altered in the U.S. as well—being plowed under and re-seeded, for example, as American Airlines Flight 179 in Chicago in 1979 [personal observation].) These methods include establishing a grid for recording of provenience, creating boundaries for crowd control (both methods used for aircraft crash sites), the use of a metal detector, wet screening, inspection of plant forms and topography changes, notation of disturbed soil, and the use of a probe (all techniques used in buried body recoveries).

Most importantly, the utilization of an emic viewpoint and dual forensic recovery methods allowed the recovery team to obtain evidence which was crucial to answering questions about the fate of missing servicemen. Because of this, emotional healing can finally be initiated for family members and loved ones.

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