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TIGHAR AND THE TBD IN JALUIT: An Example of the Complexities to be Considered in Planning Submerged Historic Aircraft Recovery

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The recovery and conservation of historic aircraft, particularly from submarine environments in places like Micronesia, is fraught with complexities both political and technical. It is easy to underestimate these difficulties, with catastrophic results. Work currently underway by The International Group for Historic Aircraft Recovery, the United States Navy, and other partners on a rare dive bomber in Jaluit Lagoon, Republic of the Marshall Islands, exemplifies these difficulties and means toward their resolution.

The waters of Micronesia are littered with aircraft wrecks, part of the detritus of World War II. Although many are fragmented as a result of the way they crashed, the damage they sustained in combat before crashing, or post-crash movement on the bottom, erosion in the surf, ^or exposure to an oxidizing environment, some are still relatively intact. These intact wrecks are especially attractive to divers, and they are tempting targets for recovery by museums and collectors.

It is easy, if one does not the matter too much consideration, to think that recovering an airplane from the bottom of a lagoon ought to be pretty easy. Make sure it's detached from the bottom, float a barge over it with a crane, hook the crane to the lifting rings that many aircraft have, or to slings that you work in underneath to cradle the wings and fuselage, and lift away.

It is, of course, not really that easy. This paper discusses some of the factors that make submerged historic aircraft recovery hard, using a real-life case study in the Marshall Islands as a point of illustration.

THE TBD DEVASTATOR TORPEDO BOMBER

The Douglas TBD Devastator torpedo bomber is among the world's rarest military airplanes – at least, among the rarest airplanes of which examples still exist at all. Only 129 were built by the Douglas Aircraft Company in the years before World War II. In a recent TIGHAR newsletter, Richard Gillespie has provided a succinct summary of the TBD's history, which is reproduced here with his permission:

> *No aircraft type played a more significant role in stemming the Japanese tide of conquest in the opening months of the Pacific war. No aircrews suffered greater proportional losses. And no airplane has gotten a more raw deal from history than the Douglas TBD-1 "Devastator."*

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When it joined the fleet in 1936, the TBD-1 heralded a new era in naval aviation. Its sleek monoplane design, all metal construction, 200 mph-plus speed, powered folding wings, and retractable landing gear stood in stark contrast to contemporaries like the British Fairey Swordfish. Strange as it may seem, the Devastator was the first American carrier-based aircraft to be equipped with wheel brakes.

Today the Devastator is most often remembered as the woefully obsolete torpedo bomber whose crews were slaughtered at the Battle of Midway. Of the forty-one TBDs launched that day from USS Hornet, Enterprise, and Yorktown, only four returned – a 90% loss rate. All of the fifteen airplanes in Hornet's squadron (VT-8) were shot down. Not a single torpedo found its mark.

What is usually forgotten is that the TBD's newer, faster, more heavily-armed replacement, the Grumman TBF-1 "Avenger" fared no better that day. Of the six Avengers that participated in the battle, five were lost and the one surviving aircraft just barely returned, shot to pieces and with only two of its three crew members still alive.

The horrific losses suffered by the American torpedo bombers at Midway were not so much due to any inadequacy of the design as to the limitations imposed on the aircraft by the weapon they carried combined with a disastrous tactical situation.

The Bliss-Leavitt Mark XIII aerial torpedo was apt to break apart if dropped from an altitude greater than 100 feet and a speed higher than 110 knots. An aircraft thus engaged in a torpedo attack against a warship was extremely vulnerable to anti-aircraft fire and defending fighters. The key to successful deployment of the torpedo depended upon either complete surprise or assault by several aircraft from multiple directions, covered by friendly fighters and carefully choreographed with simultaneous dive-bomber and horizontal bomber attacks to divide the enemy's defensive fire.

On May 7, 1942, at the Battle of the Coral Sea, twenty-two TBDs were among ninety-three aircraft that carried out coordinated attacks on the Japanese aircraft carrier Shoho, sinking her in a matter of minutes. American losses were minimal.

The confused, catch-as-catch-can nature of the tactical situation at Midway resulted in the torpedo bombers making unsupported attacks upon alerted and heavily defended targets. The Devastator crews pressed on despite these overwhelming odds and the result was as tragic as it was inevitable. Their sacrifice, however, was not unrewarded. The low level attacks by the TBDs served to pull the Japanese fighter cover down "on the deck" allowing the high-flying SBDs to reach the target area and begin their dives unopposed. The resulting accuracy of the American dive bombing attacks was largely responsible for the victory at Midway.

Unquestionably obsolete by the time it saw combat, the Devastator nonetheless played a crucial role in the opening months of the Pacific war. After Midway, the TBD was relegated to stateside training duties where accidents and mishaps further reduced its ranks (Gillespie 2006).

Only four TBDs are known to exist in the world today. One is in deep water and rather ragged condition off Florida. Another is similarly situated, in similar condition, off California. The other two are in Jaluit Lagoon.

THE LOSS OF THE JALUIT TBDS

In February 1942, just two months after Pearl Harbor, the carrier USS *Yorktown* launched the first major U.S. offensive operation of the Pacific War: an aerial raid on Jaluit Atoll, the Japanese command center in the Marshall Islands. Undertaken under difficult weather conditions, the raid did less damage than planned.

Two TBDs, each carrying a three-man crew, became lost in the weather and ran low on fuel over the atoll. Unable to get back to their carrier, the pilots had to ditch their planes in the lagoon, landing about 100 meters apart. The two three-man crews escaped safely from the aircraft and paddled an inflatable raft ashore on Pinglap Island on the west side of Jaluit. There they were sheltered awhile by the island's residents, and then surrendered to the Japanese. All six men were imprisoned in Japan for the duration of the war, and repatriated safely at war's end. Two are still alive at this

writing. The aircraft sank gently to the bottom of the lagoon, and remain there to this day.

DISCOVERY, AND THE COMING OF TIGHAR

In 1997, in the course of a survey carried out under contract with the Republic of the Marshall Islands (RMI) Historic Preservation Office (HPO), divers Matt Harris and Lucy Martin discovered one of the TBDs at a depth of about 17 meters (60 feet), a short distance off Pingelap (Harris and Martin 1997). In 2002, Matt Holly and Brian Kirk discovered the other, at about 36 meters (130 feet). Both aircraft were virtually intact, with the deeper of the two in particularly pristine condition.

The International Group for Historic Aircraft Recovery (TIGHAR) is a non-profit research and educational organization based in Wilmington, Delaware, U.S.A. Among TIGHAR's purposes are the preservation of historic aircraft and researching aviation history; the organization is best known for its long-term interdisciplinary project testing the hypothesis that Amelia Earhart landed and died on Nikumaroro Island in the Phoenix Group (King, Jacobson, Burns & Spading 2004). TIGHAR became interested in the Jaluit TBDs because they presented obvious targets for recovery, and TIGHAR specialists knew that any such recovery would be technically challenging (for a summary of TIGHAR's initial resurvey of the TBDs and other Jaluit wrecks, see TIGHAR 2004). The fear was – and is – that someone without such knowledge would attempt recovery of all or parts of the planes, with destructive results. A truly professional recovery job was in order, if either of the planes was to be recovered at all.

THE CURRENT PROJECT

TIGHAR is currently allied with the Museum of Naval Aviation in Pensacola Florida, the U.S. Navy Historical Center in Washington DC, and the Institute for Nautical Archaeology at Texas A&M University, studying the feasibility of recovering one of the two Jaluit TBDs for exhibition in the Museum. We hope, in the end, to effect a successful recovery that is beneficial not only to the partners in the project but to the people of Jaluit, the Marshall Islands, and the United States. But we have a long way to go before such success will be realized. My point in presenting this paper, and the subject of the rest of it, is to describe some of the obstacles that exist to recovery and what we are doing to surmount them. This is, in effect, a cautionary tale. Don't try this at home.

What obstacles must be surmounted before we can recover one of the TBDs – or, quite likely, any other aircraft similarly situated? The difficulties fall into two broad categories: legal and technical.

LEGAL ISSUES

The legal issues involve who owns the wrecks – or to be more precise, who has the authority to control what happens to them. There are at least five sets of contenders for this status.

One obvious party is the United States Navy, which does not give up its ships or airplanes. Under international agreements and its own regulations, the Navy retains title to downed U.S. Naval aircraft wherever they exist. The Navy strenuously asserts and defends its claim of title, and holds that it has the authority to issue and deny permits for any activity involving such an aircraft.

Another party with a serious claim to the wrecks is the government of the Republic of the Marshall Islands. The aircraft are, after all, in RMI territorial waters. Even if the RMI does not technically own the wrecks, under its laws the RMI government (represented by the HPO) has the authority to issue – or deny – permits for any archaeological or other work on historic properties within the Republic's boundaries, and the government controls the sea bottom below the mean high tide mark. Further, in the Compact of Free Association executed between the RMI and the United States in 1982, the U.S. agreed to transfer to the RMI title to all "property of the Government of the United States in the Marshall Islands" (Compact of Free Association, Section 234) arguably this included sunken aircraft.

But the RMI, as its name implies, is a republic, whose constituent atolls retain a great

deal of governmental authority, so another party with a strong claim to own, or at least control, the TBDs is the local government of Jaluit Atoll. While the RMI's claim might be technically superior to Jaluit's, it is virtually unthinkable that the national government would not support the interests of the local government.

But both the RMI government and the government of Jaluit are modern constructs, and in the Marshall Islands as elsewhere in the Pacific, traditional systems of land tenure and social authority remain very strong. It would be very unusual for the elected government of Jaluit to try to overrule the judgments of traditional authorities. Traditionally, each large island or atoll has an *Iroij*, or ruler, who controls land use. Under the Iroij are the *Alaps,* clan heads, who manage the lands assigned to their lineages. Finally, subject to the authority of the Iroij and the relevant Alaps, families and individual citizens of Jaluit have traditional rights to the use and enjoyment of land, including "land" on reefs and underwater. The modern RMI constitution voids such rights to underwater acreage in favor of government control, but few individual Jaluitese are deeply conversant with constitutional law.

Each of these parties is prepared, more or less, to assert its absolute right to control the fate of the TBDs, and in the litigious Euroamerican tradition the matter would need to be settled before anything could be done with or to the wrecks. Anything legal, that is; practically speaking no one is in a position to police the wrecks. It is only their remote, submerged condition that currently preserves them from pilferage.

TIGHAR's approach has been to respect everyone's perceived rights, to challenge none, to encourage all to respect all others, and to work toward a management scheme for the TBDs that will satisfy everyone. We assume that all ownership rights are legitimate in their own legal and cultural contexts, and that no one assertion needs to prevail if all possible owners agree on how the aircraft will be managed. We cannot speak for any of the parties involved, of course, but we believe that we are close to agreement among them all – in principle – on a plan for management. In general, this plan involves preserving one TBD in place within Jaluit Lagoon, while carefully recovering the other, conserving it, and placing it on exhibit at the Museum of Naval Aviation. Interpretation of the museum TBD would encourage responsible visitation to the *in situ* TBD, thus serving Jaluit's tourism industry. A multi-party management agreement or agreements will, we hope, represent everyone's ownership of the aircraft in a manner that is mutually agreeable.

TECHNICAL ISSUES

One reason we have not reached a final agreement about how to manage the TBDs is that there are many technical uncertainties to be resolved before we will even know what management options are realistic to employ. We hope and think that it is feasible to recover the aircraft and interpret it in the Museum, but we are not yet sure that this is the case, and we by no means yet have the resources to attempt it.

An aircraft like the TBD is mostly made of aluminum, which can be a volatile metal when submerged for long in salt water and then brought into an oxygen-rich environment. In some cases, long-immersed aluminum brought out of salt water into the air has deteriorated dramatically in hours or less. To make matters worse, a TBD is not *all* aluminum. Over 250 different kinds of materials went into making a TBD, many of them combined into complex interacting structures. We need to worry not only about what aluminum will do when moved from salt water into air, but about what aluminum will do that is in contact with steel, copper, and a host of other materials. How will they interact with each other and their changing environment?

The materials that make up the airplane are not the only variables to consider. Sea water is not chemically uniform. The water in Jaluit Lagoon is doubtless considerably different from seawater off, say, Hawaii, and there may be significant differences between different parts of the same lagoon, or different depths in the water column. As a result, tests done on ma-

terials from an airplane elsewhere in the world may not accurately represent how the same materials will react when pulled out of Jaluit Lagoon.

Finally, there is the simple fact that Jaluit is a very long way from any sort of artifact conservation facility, and a much longer way from a facility equipped to handle something of the size and complexity of an airplane. If and when a TBD is recovered, it will have to be transported across the lagoon – a distance of some twelve miles – gotten into a large transport aircraft, and flown to a suitably equipped laboratory, all the while keeping it from falling apart or crumbling into dust.

Experiments are currently underway at Texas A&M, using pieces of an F4U Corsair found by fishermen recently off California and provided to us by the Navy. Together with an exhaustive study of the pertinent literature, this will give us the beginning of an understanding of how aluminum and other materials, in interaction, react to removal from salt water into an oxygen environment. Different conservation methods and materials are also being tried, to see which hold the greatest promise for controlling oxidation and other forms of deterioration. To get a better understanding of how metals specific to the TBD react to movement from water specific to Jaluit Lagoon into oxygen, we are proposing to recover some small panels that became detached when one of the TBDs sank, and that are now lying next to the plane on the lagoon bottom. At the same time we will recover samples of lagoon water from the wreck's immediate vicinity, to make possible laboratory experiments in an environment that closely mimics actual field conditions.

CONCLUSION

We expect someday to recover one of the TBDs, but we may not. If we cannot satisfy the various parties with rights to the wrecks, or if we cannot be sure that we can conserve the airplane properly, we are entirely prepared to walk away from the project. We suggest that this is the only responsible position for a would-be aircraft recoverer to adopt. The recovery of a historic aircraft is not worth triggering an international incident, even if it were possible to recover it in the face of opposition from any of those with perceived rights to it. And there is certainly no point in recovering an airplane only to have it fall to pieces or burst into flames.

We do not yet know what recovery of one of the TBDs may cost; a conservative estimate based on very incomplete data runs to about US$7 million, and this estimate assumes access to U.S. Navy assets. The lesson in all this is simply that the recovery of submerged historic aircraft is not something to be undertaken lightly.

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