REPORT TO CONGRESS

Feasibility and Cost Associated with Identifying the Remains of the Casualties of the USS ARIZONA (BB 39)

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Prepared by:

OFFICE OF THE
ASSISTANT SECRETARY OF THE NAVY
MANPOWER AND RESERVE AFFAIRS
NAVY PENTAGON
WASHINGTON DC 20350-1000

The estimated cost of this report or study for the Department of Defense is approximately $83,000 for the 2022 Fiscal Year. This includes $0 in expenses and $83,000 in DoD labor.

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I. REPORT REQUIREMENTS

The House Report 117-118 to accompany H.R. 4350, The National Defense Authorization Act for Fiscal Year 2022, directs the Secretary of the Navy to submit a report to the Committees of Armed Services of the Senate and House of Representatives not later than January 31, 2022 regarding the feasibility and cost associated with identifying the 85 Unknowns buried at the National Memorial Cemetery of the Pacific (NMCP) who are believed to have perished aboard USS ARIZONA (BB 39) during the Pearl Harbor attack on December 7, 1941. The report directs the Department of the Navy (DON) to consult with the private sector to leverage the most state-of-the-art advancements in applicable technologies to expeditiously bring this effort to completion. On January 24, 2022, the Navy submitted an interim response informing the congressional defense committees the report would be completed by March 15, 2022.

II. EXECUTIVE SUMMARY

The DON assessed the feasibility and cost associated with the disinterment and subsequent identification of the remains of 85 unknown Sailors and Marines buried at the NMCP who perished aboard USS ARIZONA during the Pearl Harbor attack on December 7, 1941. As part of the effort, the DON, in conjunction with the Defense POW/MIA Accounting Agency (DPAA), and the Armed Forces Medical Examiner System – Armed Forces DNA Identification Laboratory (AFMES-AFDIL), analyzed the costs, resources, and time associated with undertaking such a monumental effort. The DON also looked at the human impact this effort would have on the families of nearly 1,000 Sailors and Marines who remain entombed in the USS ARIZONA Memorial and would therefore remain unidentified, as well as those who are waiting to be recovered and identified at other burial sites around the world.

Identifying the Sailors and Marines buried in the NMCP will cost the Navy and Marine Corps casualty program offices approximately $2,700,000 for just their portion of the larger effort. This figure is comprised of costs associated with building genealogical family trees; determining primary and secondary next-of-kin; and sourcing and mailing Deoxyribonucleic Acid (DNA) kits to obtain Family Reference Samples (FRS). There are also additional miscellaneous expenses such as costs for administrative materials. The effort will also require the program offices to expend approximately 12,600 hours to complete their work. This duration includes the time necessary to coordinate with the contract genealogists for family tree creation; primary and secondary next-of-kin identification; to prepare, mail, receive, and process initial family participation notifications and DNA kits; and final identification announcements.

It is more difficult to estimate the costs and time that will be incurred by DPAA and AFMES-AFDIL. Costs to disinter the 85 USS ARIZONA crew by DPAA is approximately $150,000. However, the costs to analyze and identify these remains are extremely difficult to estimate with any degree of certainty. Sufficient dental and anthropological antemortem records are currently lacking and a lack of a robust inventory of DNA FRS introduces complex variables in estimating the required manpower and costs to analyze and identify the remains. For temporal reference, the recent USS OKLAHOMA (BB 37) identification effort spanned approximately six years and required the collection of FRS for 388 Service members. The USS ARIZONA effort would require collecting at least 681 additional FRS to meet the Department of Defense (DoD)

requirement for 60% minimum threshold for disinterment. Moreover, when the USS OKLAHOMA effort began, DPAA had 80% of FRS on hand, compared to only 2% FRS for the USS ARIZONA.

As a result, the total cost and time required to identify the remains of the 85 Unknowns buried at the NMCP is difficult to estimate. Based on costs for the USS OKLAHOMA project, the cost and effort will likely increase two to threefold. Additionally, past experience has shown that regardless of a project's initial scale, whether large or small, disinterment and identification efforts often reveal unforeseen circumstances that extend completion timelines and increase costs. For example, as part of the recent USS OKLAHOMA project, a casket thought to contain the remains of five Service members was disinterred, only to discover that the casket contained the remains of approximately 100 individuals. It is possible that the USS ARIZONA effort could reveal similar complications and challenges.

Because of this project's scale, the task of identifying the 85 Unknowns will consume nearly all capabilities and capacity of the Navy and Marine Corps program offices, as well as create a competing and disproportionate demand for the limited resources of DPAA and AFMES-AFDIL for more than a decade. This effect will very likely, greatly degrade the collective accounting of the tens of thousands missing from all conflicts, a fact which is troublesome considering that the DoD attempts to manage and balance its resources and capabilities equitably among all current and future recovery, disinterment, and identification efforts.

Most importantly, this effort will impact more than just the families of the Sailors and Marines who may be represented in the 85 Unknowns. As stated above, in-progress or pending recovery, disinterment and identification efforts will be affected. Additionally, there will be about 1,000 families who provide DNA samples in hope of an identification that will not receive closure. As mentioned, there are many entombed onboard the USS ARIZONA, and, as we saw with the USS OKLAHOMA project, many of the recovered remains will not physically be able to be identified. This frustration will further contribute to the grieving, anxiety and lingering questions for families.

In order for the DON to also independently consult with the private sector on the availability of the latest state-of-the-art genealogy technologies, the DON would need to conduct market research under part 10 of the Federal Acquisition Regulations (FAR) to identify available technologies and sources – a process that will take several months. According to DPAA and AFDIL, very few, if any, private sector entities have the capability to extract usable DNA or the proper DNA testing methods to analyze the chemically treated and highly degraded samples that have become typical in these recovery scenarios.

III. INTRODUCTION

Our Nation owes it to our fallen and their surviving family members the fullest possible accounting of missing personnel. The tragic attacks on Pearl Harbor on December 7, 1941 resulted in the death of 1,177 of the total 1,512 USS ARIZONA crew. The vast majority of the 1,177 crew members remain entombed and reverently honored onboard the USS ARIZONA Memorial. While 106 fallen crew members were recovered and identified following the attack,

85 Unknowns remain buried at the NMCP. DPAA is responsible for accounting for missing Service members from designated past conflicts, including World War II. Additionally, AFMES-AFDIL is DoD's only forensically accredited DNA testing laboratory for the identification of human remains and supports DPAA in its mission to identify missing Service members. Therefore, DPAA and AFMES-AFDIL were consulted in preparing this report.

IV. BACKGROUND

The USS ARIZONA suffered a massive explosion when it was struck by multiple enemy bombs during the December 7, 1941, attack on the Pearl Harbor Naval Base. As a result, 1,177 Sailors and Marines were killed. The remains of 106 of the crew were recovered and identified, leaving 1,071 unaccounted from the attack, the vast majority of whom are entombed in the USS ARIZONA Memorial.

In December 2021, DPAA, AFMES-AFDIL, and the DON completed a six-year, multi-million dollar project to identify 388 unknown remains of the crew of the USS OKLAHOMA. These efforts resulted in the identification of 355 Sailors and Marines with 33 remaining unidentified. All 388 unknown remains of the USS OKLAHOMA were buried at NMCP and 80% of FRS was on file prior to the start of the project. However, in the case of the USS ARIZONA, there are only 85 Unknowns reported to be associated with the 1,071 unaccounted for remains buried at NMCP, and only 2% of FRS is currently on file.

10 U.S. Code Section 1501 (the "Missing Service Personnel Act") directed the Secretary of Defense designate "a single organization within the DoD have responsibility for Department matters relating to missing persons from past conflicts, including accounting for missing persons and persons whose remains have not been recovered from the conflict in which they were lost." DoD Directive 5110.10, "Defense POW/MIA Accounting Agency," establishes DPAA as the single organization within the Department of Defense responsible for past conflict personnel accounting pursuant to 10 U.S.C. § 1501. Furthermore, DoD Instruction (DoDI) 1300.29, "Mortuary Affairs Program," assigns DPAA the responsibility for coordinating and making recommendations on disinterment requests for eligible DoD personnel. The Instruction also identifies the Assistant Secretary of Defense for Manpower and Reserve Affairs (ASD(M&RA)) as the official authorized to act on disinterment requests of unknown remains from United States controlled cemeteries.

V. FEASIBILITY AND COST ASSESSMENT

Sanctity of the Grave for Those Lost At Sea

The DON respects the sanctity of human remains and, in conjunction with long standing customary international norms and the traditions of other seafaring nations, it recognizes the sea as a fit and final resting place for those who perish at sea. The USS ARIZONA Memorial is deemed a national shrine worthy of preservation through national legislation. The Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 states that no person may plan, assist, or participate in any activity which disturbs, injures, or removes sunken military craft lost for more than one year, when such activity is conducted primarily to identify or recover human

remains or personal effects. Efforts to identify any remains entombed onboard the USS ARIZONA, beyond the 85 Unknowns interred at the NMCP, would violate the sanctity of the grave for those lost at sea and would oppose centuries of Naval tradition and precedent.

Feasibility and Cost for DPAA / AFMES-AFDIL

DPAA costs to disinter the 85 USS ARIZONA Unknowns are approximately $150,000, but the extent and costs for DPAA and AFMES-AFDIL to analyze these unknown remains would be extremely difficult to estimate with any degree of specificity. Lacking sufficient dental and anthropological antemortem records and DNA FRS with which to compare introduces complex variables to estimating the required manpower, time, and costs to analyze the remains.

DPAA's previous disinterment of unknown remains from losses associated with the attack on Pearl Harbor, such as the USS OKLAHOMA, USS CALIFORNIA, and USS WEST VIRGINIA showed significant commingling and inaccurate grave associations. Based on these findings, as well as a preliminary assessment of the records of USS ARIZONA crewmen, any disinterment of the 85 USS ARIZONA Unknowns must be addressed as a group.

To gain approval to disinter unknown remains interred as a group, DoDI 1300.29 requires the DoD to possess DNA FRS or other medical means of identification (dental, chest radiograph, or anthropological records) for at least 60% of the associated Service members. However, unlike the abovementioned three ships whose Unknowns were all interred in the NMCP, the group of USS ARIZONA losses include the 85 Unknowns at the NMCP and the nearly 1,000 interred in the sunken ship's hull that is now the USS ARIZONA Memorial.

DPAA has Individual Deceased Personnel Files (IDPFs) for more than 99% of those who were assigned to USS ARIZONA at the time of the attack. However, less than half the IDPFs contain basic dental information; approximately 450 (42%) of those unaccounted for from the USS ARIZONA. As such, the comparison of the Unknowns' dental remains against antemortem records would be limited, rendering the critical odonatological line of evidence much less effective in the identification process. Similarly, approximately half of the IDPFs have a recorded stature, so anthropological analysis will also be very constrained.

As it was with the USS OKLAHOMA Unknowns, the use of DNA as a line of evidence and FRS with which to compare the remains against will be significant. However, the DoD has on-hand FRS representing only 25 unaccounted-for USS ARIZONA crewmen (approximately 2%). An additional 681 FRS would need to be collected to meet the DoD 60% threshold for disinterment. However, based on DPAA's experience in identifying remains buried as Unknowns, the more FRS that can be collected, the greater number of identifications. For example, in the case of USS OKLAHOMA, DPAA had 80% of FRS on hand when the disinterments began, and multiple types of FRS (maternal, paternal, and autosomal) were collected from each family, thereby increasing the probability of identifications.

Although the above facts significantly increase the already inordinate challenges to disinter and analyze unknown remains for the purpose of identification, the feasibility of the USS ARIZONA effort is most adversely affected by the fact that approximately 92% of the 1,071 unaccounted-

for crewmen are not collocated with the 85 Unknowns. These will never be individually identified because they are all appropriately honored and interred at the USS ARIZONA Memorial.

Before the group of 85 Unknowns could be disinterred, the DON would have to collect FRS for at least 681 more Sailors and Marines (and much more to increase the success rate). Ideally, AFMES-AFDIL would request a maternal and a paternal, or a maternal and autosomal reference for each Service member. This would require extensive genealogical research, which the USS OKLAHOMA project proved was extremely challenging and the competition stiff for resources (i.e., staff, time, and funding). Moreover, the collection of FRS alone could take close to 10 years or more before DPAA and AFMES-AFDIL are able to complete the disinterment and begin analyzing and identifying the remains.

Feasibility and Cost for Navy and Marine Corps

The Navy and Marine Corps casualty offices conducted project feasibility studies that aimed to assess the monetary and temporal costs associated with this undertaking. Their analyses also addressed the potential personal impact this effort would have on families of those Service members entombed onboard the USS ARIZONA.

Based on the feasibility studies, the cost by the Navy and the Marine Corps to support the identification effort is estimated to approach $2,700,000. This valuation is a combination of the expenses incurred to build genealogical family trees; family travel and re-interment costs; and miscellaneous expenses such as administrative materials and the sourcing and mailing of FRS DNA kits.

The feasibility studies further examined the estimated amount of time required to complete the identification. The casualty teams accounted for the time necessary to coordinate with the contract genealogist for family tree creation and primary and secondary next-of-kin identifications; to prepare, mail, receive, and process initial family participation notifications and FRS DNA kits; identification announcements; and the processing of travel claims. Specific to the work required of the Navy and Marine Corps casualty offices, the amount of time to identify the remains associated with the 85 Unknowns is estimated to approach 12,600 hours.

Impact to Mission and Families

Irrespective of the tangible costs to research, disinter, and analyze the 85 Unknowns associated with the USS ARIZONA, the capabilities and capacities of DPAA, AFMES-AFDIL, and the Navy and Marine Corps casualty program offices would be significantly consumed. The effort would create a competing and disproportionate demand for the limited resources of DPAA and AFMES-AFDIL for more than a decade. This effect will very likely, greatly degrade the collective accounting of the tens of thousands missing from all conflicts. The DoD tries its best to manage and balance its resources, applying its capacity, capabilities, and resources in a manner that is equitable to all families, and to do so as efficiently and effectively as possible. For reference, the recent USS OKLAHOMA identification effort spanned approximately six

years and demanded a vast majority of the Navy and Marine Corps casualty offices' bandwidth and DPAA's prioritization of effort.

Experience has shown that large scale identification projects yield unforeseen hurdles, which make initial cost and time estimates misleading. For example, as part of the USS OKLAHOMA project, a casket thought to contain the remains of five Service members was disinterred, only to discover that the casket contained the remains of approximately 100 individuals.

Pursuing this effort will give false hope to the vast majority of USS ARIZONA families that their loved one may be identified, assuming there are 85 unidentified Service members currently interred in the NMCP, representing about 8% of the 1,071 that remain unaccounted for. Therefore, even if this effort is one hundred percent successful in identifying the 85 Unknowns, there will still be about 1,000 families whose loved ones are entombed in the USS ARIZONA Memorial. They will not receive identification announcements and will have endured years of anxiety only to be left with questions.

Private Sector Consultation

In order for the DON to effectively consult with the private sector regarding the most state-of-the-art advancements in applicable technologies for the identification of the remains of the 85 Unknowns, the DON will need to conduct market research under part 10 of the FAR to identify available technologies and sources. This may include publishing a Request for Information in appropriate technical or business journals and/or holding an industry day, prior to issuing a solicitation. The DON would then develop a written requirement and issue it to the appropriate Contracting Authority. This process typically involves several months.

For this report, we consulted with DPAA and AFMES-AFDIL to obtain additional insights. According to DPAA and AFDIL, very few, if any, private sector entities have the capability to extract usable DNA or the proper DNA testing methods to analyze the chemically treated and highly degraded samples submitted by DPAA for DNA testing. As such, AFMES-AFDIL developed processes and procedures to extract and enrich human DNA and developed optimized testing methods that allow successful DNA typing. For example, AFMES-AFDIL can generate a mitochondrial DNA (mtDNA) sequence from a non-chemically treated bone sample 94% of the time. In 2016, AFMES-AFDIL developed and implemented a revolutionary mtDNA next generation sequencing assay for use with highly degraded and chemically treated samples. Currently AFMES-AFDIL remains the only forensic laboratory with an American National Standards Institute National Board of Accreditation's (ANAB)-International Organization for Standardization (ISO) 17025:2017 and Federal Bureau of Investigation-Quality Assurance Standards (FBI-QAS) validated and forensically accredited next generation mtDNA sequence method. AFMES-AFDIL is accredited to the ANAB-ISO 17025:2017 forensic standards and the FBI-QAS for biology, DNA testing, and DNA comparison.

AFMES-AFDIL uses and optimizes a combination of mtDNA sequencing, autosomal Short Tandem Repeat (auSTR), and Y-Chromosomal Short Tandem Repeat (YSTR) methods to link unknown Service members with FRS to support scientific findings of identification. These testing methods are currently the only testing methods authorized by the National DNA Index

System (NDIS) to be used by forensically accredited crime laboratories for their use in establishing the identity of a perpetrator of a crime or the identity of unknown human remains.

To identify remains, DPAA uses multiple lines of evidence whenever possible and available. All lines of evidence must converge to the exclusion of all other reasonable candidates before an individual identification is made. DPAA's recovery and identification processes are best practices in human identification and are accredited by the ANAB-ISO 17025:2017 standards for forensic testing laboratories.

Leveraging authorities provided by the Congress, DPAA does work extensively with private sector entities through partnering and contracting arrangements. Collaborating with the University of Utah, DPAA scientists are advancing isotope analysis capabilities. Geographic differences in diet can allow stable isotope analysis to separate individuals into country of origin and sort commingled remains, thus reducing the need for DNA analysis, but this is more for exclusionary than identification purposes. DPAA is the first laboratory in the U.S. to be accredited in Geographic Profiling using stable isotopes and is unique within the DoD laboratory system.

AFMES-AFDIL is the DoD's only human remains DNA testing laboratory mandated with developing and implementing state-of-the-art DNA testing to assist with the identification of Service members from current day and past conflicts. AFMES-AFDIL's forensic DNA testing processes are best practices in the DNA forensic community and are accredited to the FBI-QAS and the ANAB-ISO 17025:2017 forensic standards.

DPAA and AFMES-AFDIL have developed unique capabilities because the remains they are tasked to recover and identify have been either treated with chemical preservatives prior to interment or have lain in harsh environments exposed to the elements and normal ecological processes that negatively affect preservation (e.g., bacteria, fungi, acidic soil). Most, if not all, private sector entities have developed or utilize commercial kits that were developed for crime laboratory sampling (relatively recent missing persons or criminals). These contain a high quality and quantity of DNA, significantly more so than the DNA AFMES-AFDIL tries to extract from past conflict remains.

AFMES-AFDIL frequently consults with the private sector to develop new technologies. In 2017 working with the DoD Defense Forensic Enterprise, AFMES-AFDIL submitted a request for proposal for a private sector agency to develop a Single Nucleotide Polymorphism (SNP) assay and software that allow any family member within four generations of a missing Service Member (great-great aunt/uncle or 1st cousin once removed) to be a reference and to work with chemically treated and high degraded human remains samples submitted by DPAA for testing. Four generations allow the majority of the FRS AFMES-AFDIL has collected since 1992 to be utilized with this new DNA testing method. A private sector entity, Parabon NanoLabs, Inc., was awarded the project to develop the SNP analysis software and identify the SNP panels to be used in the DNA testing assay. AFMES-AFDIL was tasked to develop the SNP capture assay and optimize for use with DPAA samples. This project was completed in June 2021 and is currently undergoing extensive internal validation that meets all ANAB-ISO 17025:2017 and FBI-QAS accreditation requirements. Although there are significant, unique and challenging

circumstances to identify the 85 Unknowns associated with the USS ARIZONA, DPAA and AFMES-AFDIL do not envision needing private sector assistance.

VI. CONCLUSION

While the DON, DPAA, and AFMES-AFDIL agree that the identification of the 85 Unknowns associated with USS ARIZONA and buried at NMCP is feasible, it will require significant resources and an inordinate amount of time. There are unique constraints with the vast majority of remains entombed onboard the USS ARIZONA, and the opportunity cost of such an endeavor on other recoveries, disinterments, and identifications must be considered. Identifying these remains is a monumental task with time and cost estimates being difficult to accurately project. Past experience has shown that large scale identification efforts require years of coordination and often uncover unforeseen issues that could delay completion. Additionally, the effort required will affect more than just the families of the 85 Unknowns. The DoD attempts to manage and balance its resources and capacities to conduct recoveries, disinterments, and identifications in a manner that is equitable for all families from all conflicts. Additionally, there are about 1,000 families associated with Unknowns entombed in the USS ARIZONA Memorial who might provide FRS, but it is reasonable to conclude many will be left without identifications.

The DON respects the sanctity of human remains and, in conjunction with long standing customary international norms and the traditions of other seafaring nations, it recognizes the sea as a fit and final resting place for those who perish at sea. The USS ARIZONA Memorial is deemed a national shrine worthy of preservation through national legislation. Efforts to identify any remains entombed onboard the USS ARIZONA, beyond the 85 Unknowns interred at the NMCP, would violate the sanctity of the grave for those lost at sea and would oppose centuries of Naval tradition and precedent.