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Report to Congressional Committees

March 2021

COAST GUARD

More Information Needed to Assess Efficacy and Costs of Vessel Survival Craft Requirements

GAO@100
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GAO-21-247

GAO@100 Highlights

Highlights of GAO-21-247, a report to congressional committees

March 2021

COAST GUARD

More Information Needed to Assess Efficacy and Costs of Vessel Survival Craft Requirements

Why GAO Did This Study

Since 2010, the Department of Homeland Security's (DHS) Coast Guard investigated over 50,000 maritime vessel accidents, including some resulting in casualties (dead or missing persons). The Coast Guard investigates accidents and requires vessels to carry lifesaving equipment to reduce the likelihood of casualties. Among this equipment are out-of-water survival craft to ensure no part of a person is immersed in water.

The Coast Guard Authorization Act of 2016 includes a provision for GAO to examine the extent of vessel-based casualties from water immersion and the efficacy of various lifesaving equipment. This report assesses the extent the Coast Guard has (1) data from 2010 through 2019 showing vessel-based casualties and survivability; (2) estimated costs and benefits of implementing out-of-water survival craft requirements for vessel owners; and (3) guidance for designating cold water areas and corresponding equipment requirements based on the best available data. GAO reviewed Coast Guard guidance and vessel accident data and interviewed Coast Guard and industry officials.

What GAO Recommends

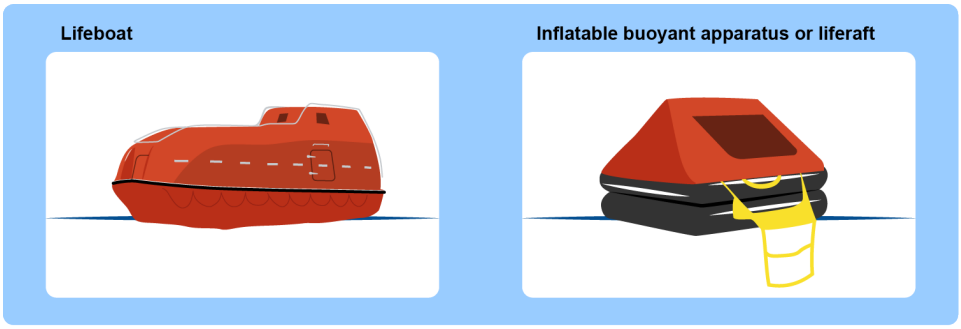
GAO makes four recommendations, including that the Coast Guard require investigators collect data about people's use of lifesaving equipment in accidents, fully implement cost estimate best practices for out-of-water survival craft requirements, and if necessary, update cold water areas determinations. DHS concurred with 3 of 4 recommendations. GAO continues to believe the findings in the report support the recommendations.

View GAO-21-247. For more information, contact Nathan Anderson at (206) 287-4804 or andersonn@gao.gov.

What GAO Found

Coast Guard data show that during fiscal years 2010 through 2019 most people survived vessel accidents, and out-of-water survival craft, such as a lifeboat, was used more often than other types of lifesaving equipment. However, the Coast Guard has limited information about people involved in vessel accidents, such as their date of birth, potential disability, and type of lifesaving equipment used, if any. For example, Coast Guard data did not include the type of lifesaving equipment used, if any, for about 45 percent (1,733 of 3,847) of accident survivors. By requiring its investigators to collect date of birth, known disability, and use of lifesaving equipment information of survivors and casualties of vessel accidents, the service could better assess the efficacy of lifesaving equipment.

Examples of Out-of-Water Survival Craft



Source: GAO analysis of U.S. Coast Guard documentation. | GAO-21-247

The Coast Guard estimated costs and benefits of requiring vessel owners to carry out-of-water survival craft in its 2013 and 2017 reports to Congress, but the estimates were not fully accurate or complete. The Coast Guard did not use economically justifiable discount rates to account for the time value of money nor document its rationale, as recommended by the Office of Management and Budget (OMB). In its 2013 report, this resulted in estimated net costs $32.3 million higher than if it had. By fully implementing OMB best practices, the Coast Guard can better ensure its future estimates are accurate and complete.

The Coast Guard's 1991 guidance for determining cold water areas (59 degrees Fahrenheit and below) is based on outdated water temperature data. The guidance designates cold water areas where commercial vessels are to carry certain lifesaving equipment. Our analysis of the most recent water temperature data found that temperatures increased off the Atlantic coast for all months and Pacific coast for 10 months of the year—which does not match temperatures in the guidance. For example, the data shows that, for the month of September, waters measuring over 59 degrees expanded across almost half the area in the Gulf of Maine that the Coast Guard designated as "cold water" in 1991. By reviewing its cold water areas determination guidance to determine if it reflects current temperature data, and if necessary revising it, the Coast Guard would better ensure commercial vessels are operating with appropriate lifesaving equipment.

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Abbreviations

Coast Guard	U.S. Coast Guard
DHS	Department of Homeland Security
NOAA	National Oceanic and Atmospheric Administration
NVIC	Navigation and Vessel Inspection Circular
MISLE	Marine Information for Safety and Law Enforcement
OMB	Office of Management and Budget

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March 31, 2021

The Honorable Maria Cantwell
Chair
The Honorable Roger F. Wicker
Ranking Member
Committee on Commerce, Science, and Transportation
United States Senate

The Honorable Peter A. DeFazio
Chairman
The Honorable Sam Graves
Ranking Member
Committee on Transportation and Infrastructure
House of Representatives

Since 2010, there have been over 50,000 maritime vessel accidents investigated by the U.S. Coast Guard (Coast Guard), some resulting in people dying or going missing (casualties), according to the Coast Guard.[1] For example, in January 2019, the commercial fishing vessel MISTRESS capsized and sank off the coast of Rhode Island, and two crew went missing while the other entered a liferaft and was rescued. In another accident, in September 2011, the crew of the TRINITY II abandoned their vessel after encountering heavy winds and seas in the Gulf of Mexico. Four of 10 crew members died from drowning or exposure. Carrying lifesaving equipment aboard a vessel can help reduce the likelihood of casualties. Among this equipment are out-of-water survival craft that ensures no part of a person is immersed in water, such as lifeboats, inflatable buoyant apparatus, skiffs, and inflatable liferafts.

Within the Department of Homeland Security (DHS), the Coast Guard, a multi-mission military service, is the primary federal agency responsible for marine safety and search and rescue. In carrying out these missions, the Coast Guard takes various actions to ensure that U.S. flagged

[1]The Coast Guard identifies two categories of casualties—people and vessels—in its definition of a "marine casualty or accident." See 46 C.F.R. § 4.03-1(b). The Coast Guard considers a person a casualty if they died, went missing, or were injured beyond first aid. For the purposes of this report, we define a casualty as a person who died or went missing as a result of water immersion. We also define people who were injured in a vessel accident involving water immersion as a "survivor."

vessels operate safely, such as by issuing regulations and guidance for vessel operators on the carriage of lifesaving equipment and ensuring compliance through its inspections process.[2] The Coast Guard also investigates maritime vessel accidents to determine the cause of an accident and any casualties.

To increase the likelihood of survival if an accident occurs, Coast Guard regulations require commercial vessels to carry various types of lifesaving equipment depending on, among other things, whether they operate in cold water (defined as 59 degrees Fahrenheit and below).[3] For example, the Coast Guard may require out-of-water survival craft for commercial vessels operating in cold waters to reduce the risk of hypothermia for those who must exit the vessel following an accident.[4] However, it may permit different types of lifesaving equipment aboard commercial vessels operating in warm waters, which do not present this risk.

In keeping with its congressional reporting requirements, the Coast Guard has reported over the past decade on the efficacy and costs of lifesaving equipment. Specifically, in its 2013 *Survival Craft Safety* and 2017 *Non-Immersion Survival Craft* reports to Congress, the Coast Guard reported

[2]A U.S. flagged vessel is a commercial vessel, registered and operated under the laws of the U.S., owned and operated by U.S. citizens, and used in commercial trade of the United States. See 41 C.F.R. § 102-117.25.

[3]Besides water temperature, variables that affect lifesaving equipment requirements include such things as the vessel's route, type of hull material, and whether the vessel has overnight accommodations.

[4]The Coast Guard defines hypothermia as a reduction in core body temperature, which occurs when a person is immersed in water colder than body temperature, which could lead to death.

on the number of casualties due to water immersion and costs and benefits of implementing out-of-water survival crafts requirements.[5]

The Coast Guard Authorization Act of 2016 includes a provision for us to examine the extent of vessel accident casualties due to water immersion, the efficacy of various lifesaving equipment on vessel safety and survivability, and the implementation costs of requiring out-of-water survival craft for small passenger vessels, among other things.[6]

This report assesses the extent to which: (1) Coast Guard data from fiscal years 2010 through 2019 show the number of vessel-based casualties due to water immersion and the survivability of people using lifesaving equipment; (2) the Coast Guard has estimated the costs and benefits of requiring vessel owners to implement out-of-water survival craft requirements; and (3) the Coast Guard's guidance for designating cold water areas requiring commercial vessels to carry certain lifesaving equipment is based on the best available water temperature data.

To assess the extent to which the Coast Guard's data from fiscal years 2010 through 2019 show the number of vessel-based casualties due to water immersion and the survivability of people, we obtained and analyzed vessel accident data from the Coast Guard's Marine Information

[5]U.S. Coast Guard, *Survival Craft Safety*, Report to Congress (Washington, D.C.: August 26, 2013) and *Non-Immersion Survival Craft,* Report to Congress (Washington, D.C.: June 20, 2017). The two reports were required under separate laws that contained similar but not identical reporting requirements. See, respectively, Coast Guard and Maritime Transportation Act of 2012, Pub. L. No. 112-213, tit. III, § 303(2), 126 Stat. 1540, 1563 (2012) and Coast Guard Authorization Act of 2016, Pub. L. No. 114–120, tit. III, § 301(b), 130 Stat. 27, 50-51 (2016) (short title amended from "Coast Guard Authorization Act of 2015" by the National Defense Authorization Act for Fiscal Year 2017, Pub. L. No. 114-328, tit. XXXV, subtit. A, § 3503(a), (e), 130 Stat. 2000, 2775 (2016)). Reports were due under both laws to the House Committee on Transportation and Infrastructure and the Senate Committee on Commerce, Science, and Transportation, and the report due under the Coast Guard Authorization Act of 2016 must be updated every five years.

[6]Pub. L. No. 114–120, tit. III, § 301(c), 130 Stat. at 51. Section 301(c) does not specifically refer to the implementation costs of requiring out-of-water survival craft for small passenger vessels. We derived this summary based on the statutory provisions cited in section 301(c), which refers to "the costs of the amendments and requirements under this section and section 3104 of title 46, United States Code." The referenced provisions include a requirement for out-of-water survival craft for one vessel type (passenger vessels) and an authorization for the Coast Guard to revise its regulations to adopt a higher standard of safety for another vessel type (small passenger vessels). See *id.* § 301(a), 130 Stat. at 50 (codified at 46 U.S.C. § 3104). This would include requiring out-of-water survival craft for small passenger vessels.

for Safety and Law Enforcement (MISLE) data system.[7] This enabled us to determine the number and location of vessel accidents, casualties, survivors, use of lifesaving equipment, and age and potential disability information of people involved in vessel accidents from fiscal years 2010 through 2019, the most readily available data at the time of this review.[8] To determine the reliability of these data, we reviewed Coast Guard documentation about vessel accident investigations, and its policies and procedures for reporting and entering data into MISLE, such as the *Marine Investigations: Documentation and Reporting Procedures* and *Marine Safety Manual Volume V: Investigations and Enforcement*.[9]

We also interviewed Coast Guard officials from its headquarters, three districts, and seven sectors to obtain information about the service's policies and procedures for vessel accident investigations, data entry into MISLE, data analysis, and reporting. Based on these steps, our previous work on MISLE, and vessel accident information in the system, we determined the vessel accident data and information within MISLE were reliable enough to report on, but contained data errors and data system

[7]We analyzed data from maritime vessel accidents about people–survivors and casualties–who were immersed in water or the people onboard who abandoned the vessel. We did not analyze accidents or casualties when people did not abandon the vessel in distress. This includes, such as: vessels that sank with no one onboard; vessels that were damaged outside the water, such as in dry-dock; SCUBA or snorkeling accidents; parasailing; when a person fell overboard but the vessel was not at risk; suicides; or pollution incidents that did not involve people abandoning the vessel.

[8]To determine the number of children and elderly who were casualties due to water immersion, we defined children as people under the age of 18, and elderly as aged 65 or over, at the time of the vessel accident. We then reviewed Coast Guard's age information to determine if the person was a child or elderly at the time of the accident. We found that the Coast Guard may collect a person's date of birth, but does not record their age at the time of an accident. As a result, the Coast Guard provided the age of the person involved in an accident by calculating the date of the accident relative to their date of birth. To determine the number of people with potential disabilities who were casualties due to water immersion, we considered people that Coast Guard data described as having certain conditions–such as "hard of hearing"–as a person with a potential disability. However, based on available information about people in vessel accidents, we could not determine whether a person's condition met this definition for having a disability.

[9]U.S. Coast Guard, U.S. Coast Guard Marine Investigations: Documentation and Reporting Procedures, DCN: MPS-PR-INV-05(15) (Washington, D.C.: July 2018) and Marine Safety Manual Volume V: Investigations and Enforcement, COMDTINST M16000.10A (Washington, D.C.: April 2008).

issues, such as the incorrect classification of people.[10] We reviewed the service's reporting requirements under the Coast Guard and Maritime Transportation Act of 2012 and the Coast Guard Authorization Act of 2016 and information in the Coast Guard's two corresponding reports to Congress, in 2013 and 2017.[11] We assessed the service's information against guidance in the Coast Guard's quality management system framework and Marine Safety Manual.[12]

To assess the extent to which the Coast Guard estimated the costs and benefits of requiring vessel owners to implement out-of-water survival craft requirements, we reviewed Coast Guard documentation and interviewed Coast Guard officials.[13] This documentation included the 2013 *Survival Craft Safety* and 2017 *Non-Immersion Survival Craft* reports to Congress. We selected these reports because Coast Guard headquarters officials told us that they included the relevant estimated costs and benefits of requiring vessel owners to carry out-of-water survival craft. To assess the quality of the Coast Guard's estimates, we compared them against Office of Management and Budget (OMB)[14] and

[10]See GAO, *Coast Guard: Actions Needed to Ensure Investments in Key Data System Meet Mission and User Needs*, GAO-20-262 (Washington, D.C.: July 16, 2020); and GAO, *Commercial Fishing Vessels: More Information Needed to Improve Classification Implementation*, GAO-18-16 (Washington, D.C.: December 14, 2017).

[11]See Pub. L. No. 112-213, tit. III, § 303(2), 126 Stat. at 1563 and Pub. L. No. 114–120, tit. III, § 301(b), 130 Stat. at 50-51.

[12]U.S. Coast Guard, *Mission Management System*, COMDTINST 5200.4A (Washington, D.C.: December 12, 2019); and *Marine Safety Manual, Volume V: Investigations and Enforcement*, COMDTINST M16000.10A (Washington D.C.: April 24, 2008).

[13]The estimated costs of requiring vessel owners to implement out-of-water survival craft requirements are borne by the vessel owners while the estimated benefits would accrue to individuals who use out-of-water survival craft. For the purpose of this report, the costs are the resources expended by vessel owners to replace life floats and buoyant apparatus with out-of-water survival craft, including recurring servicing expenses. Additionally, the benefits represent the reduction in fatality of individuals who use an out-of-water survival craft.

[14]OMB best practices to develop cost and benefit estimates outline nine steps and one general consideration for a regulatory impact analysis. See Office of Management and Budget, *Circular A-4: Regulatory Analysis* (Washington, D.C.: 2003).

GAO[15] best practices and determined whether they "met" or "did not meet" these best practices.[16] We selected the OMB best practices because Coast Guard headquarters officials told us they used them to develop the costs and benefits of implementing out-of-water survival craft requirements in its 2013 *Survival Craft Safety* and 2017 *Non-Immersion Survival Craft* reports to Congress. We selected GAO best practices because they are the appropriate criteria GAO uses when assessing a federal agency's analysis of the economic impact of a regulation on the private sector.[17] We also interviewed Coast Guard headquarters officials to obtain information on the service's methodological decisions in developing the 2013 and 2017 estimates in its reports.

To assess the extent to which the Coast Guard's guidance for designating cold water areas requiring commercial vessels to carry certain lifesaving equipment is based on the best available water temperature data, we reviewed Coast Guard regulations and guidance.[18] Specifically, we reviewed the Coast Guard's 1991 Navigation and Vessel Inspection Circular 7-91 (NVIC 7-91) that determines cold water areas off U.S. coastlines and the Great Lakes based on National Oceanic and Atmospheric Administration (NOAA) water temperature data.[19] We also

[15]GAO's best practices for assessment methodology for economic analysis evaluate benefits and costs of a government rule or regulation and the impact of a proposed or existing regulation on regulated entities and consumers. These GAO best practices identify five key methodological elements. See GAO, *Assessment Methodology for Economic Analysis*, GAO-18-151SP (Washington, D.C.: April 2018).

[16]In this report, we show whether the Coast Guard's practices for estimating costs and benefits of requiring vessel owners to carry out-of-water survival craft in its 2013 and 2017 reports either "met" or "did not meet" OMB or GAO best practices. We based this categorization in accordance with GAO-18-151SP definitions. For example, we determined that the Coast Guard's estimates "met" a best practice if the estimate considered and properly dealt with the element. Additionally, we determined that the Coast Guard's estimates "did not meet" a best practice if these estimates did not consider or properly deal with the element.

[17]Appendix I provides a comparison between the OMB and GAO best practices.

[18]See regulatory tables at 46 C.F.R. §§ 28.110, 28.120(a)-(c), 117.200(c), 141.305, 180.200(c), 199.630(a),and 199.640(a), which summarize lifesaving equipment requirements based on water temperature and other variables for commercial fishing vessels; small passenger vessels carrying more than 150 passengers or with overnight accommodations for more than 49 passengers; towing vessels; small passenger vessels (under 100 gross tons); and certain inspected vessels, respectively.

[19]U.S. Coast Guard, *Determination of Cold Water Areas*, Navigation and Vessel Inspection Circular 7-91 (Washington, D.C.: May 20, 1991).

obtained and analyzed 2005 through 2017 NOAA water temperature data to determine whether the Coast Guard's 1991 cold water areas determination guidance remains accurate.[20] To determine the reliability of the NOAA water temperature data, we interviewed NOAA headquarters officials about their practices for obtaining and maintaining the data. Based on these steps, we found the data to be reliable for the purpose of reporting on NOAA water temperature data. We interviewed Coast Guard officials from the above mentioned headquarters, districts, and sectors about their responsibilities and processes for implementing NVIC 7-91 and determining cold water areas. We assessed the Coast Guard's 1991 cold water determinations guidance against DHS's *Information Quality Guidelines*.[21] We also assessed them against *Standards for Internal Control in the Federal Government*.[22]

To support these objectives, we interviewed officials representing four maritime trade associations and a disability rights advocacy organization for perspectives on lifesaving equipment requirements.[23]

We conducted this performance audit from January 2020 to March 2021 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that

[20]We obtained NOAA data that contained the lowest recorded water temperature data for the Atlantic and Pacific Oceans, delineated to show the areas of water that shared the same water temperatures–known as isotherms–from 1975 through 1984 and 2005 through 2017.

[21]DHS, *Information Quality Guidelines* (Washington, D.C.: May 17, 2019).

[22]The control activities component of internal control—the actions management establishes to achieve objectives and respond to risks—was significant to this objective, along with the related principle that management should implement control activities through policies. We assessed the agency's policies and procedures for cold water determinations. GAO, *Standards for Internal Control in the Federal Government*, GAO-14-704G (Washington, D.C.: September 10, 2014).

[23]We interviewed officials from five organizations. We selected four of them because they represent operators and owners of different types of U.S. flagged vessels. These include the Passenger Vessel Association, representing passenger vessels, the Chamber of Shipping of America, representing cargo vessels, the American Waterways Operators Association, representing towing vessels, and the American Petroleum Institute, representing offshore platforms. We selected another, the Consortium for Citizens with Disabilities, to obtain perspectives on disability rights issues.

the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Commercial Vessel Lifesaving Equipment

Coast Guard-approved lifesaving equipment that commercial vessels may be required to carry fall into four general categories, as described below and shown in figure 1.

In-water survival craft. Craft designed to ensure that a person's airways–ears, nose, and mouth–are not immersed in water. For example, a life float has a buoyant platform with a mesh floor that hangs approximately 3 feet into the water, allowing a person to stand inside and keep their airways out of the water.

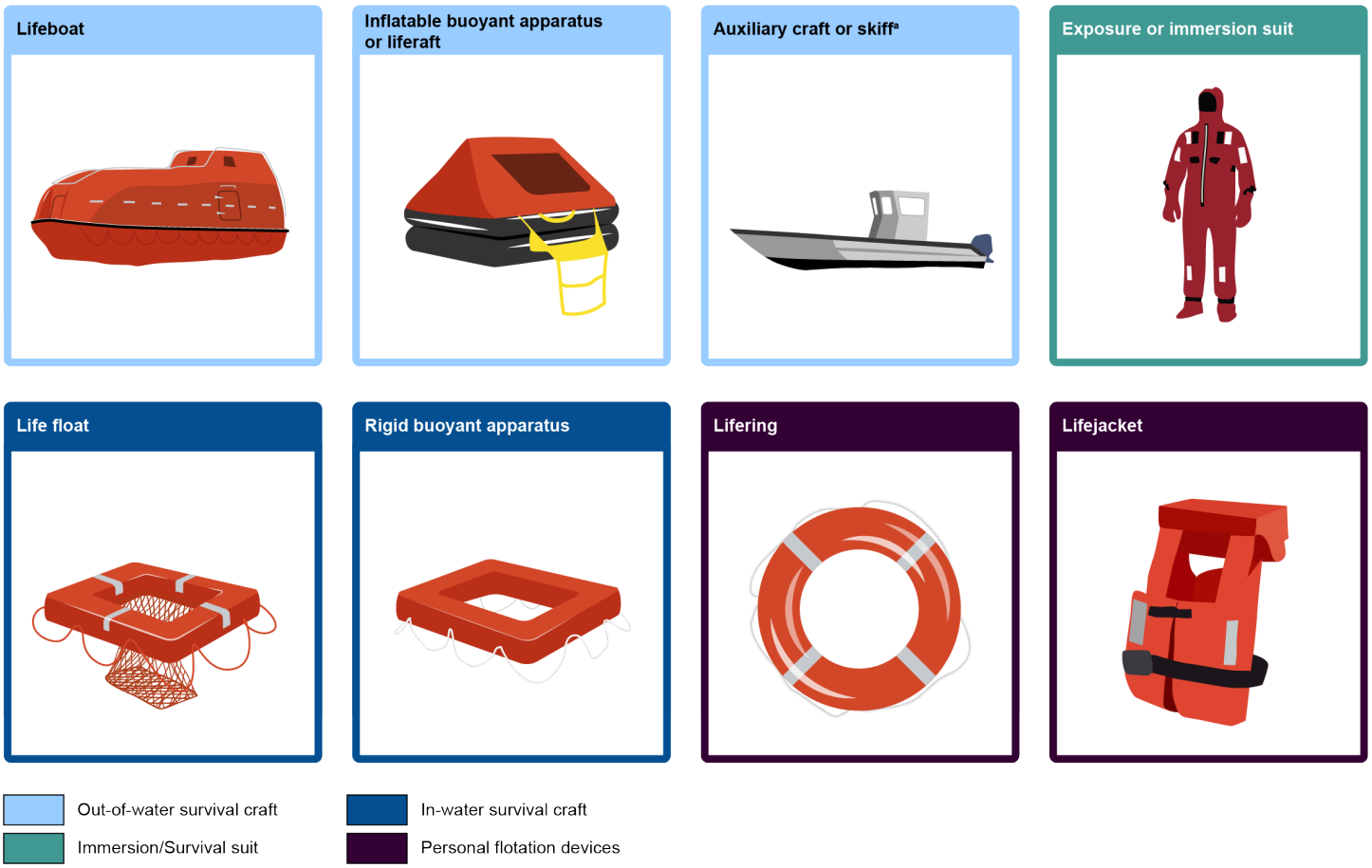
Out-of-water survival craft. Craft designed to ensure that no part of a person is immersed in water. These include lifeboats, inflatable buoyant apparatus, skiffs, inflatable liferafts, and rigid liferafts.[24]

Personal floatation devices. Devices designed to provide extra buoyancy either as a wearable device, such as a lifejacket, or a throwable device for a person immersed in water to hold onto, such as a lifering.

Exposure or immersion suits. Full-bodied suits designed to provide flotation and protection from water, including insulation from cold water.

[24]Auxiliary craft or skiffs meet Coast Guard out-of-water survival craft requirements for certain commercial fishing, small passenger, and towing vessels.

Figure 1: Examples of Coast Guard Approved Lifesaving Equipment by Category



Source: GAO analysis of U.S. Coast Guard documentation. | GAO-21-247

[a]Auxiliary craft or skiffs meet out-of-water survival craft requirements for certain commercial fishing, small passenger, and towing vessels.

Coast Guard Responsibilities for Commercial Vessel Lifesaving Equipment

The Coast Guard is responsible for issuing regulations and supporting guidance for U.S. flagged commercial vessels, including the composition of lifesaving equipment onboard. For example, Coast Guard regulations outline the type and number of survival craft that small passenger vessels are required to carry.[25] These requirements, detailed in regulations and

[25]A summary of survival craft requirements for small passenger vessels that carry more than 150 passengers or have overnight accommodations for more than 49 passengers appears at 46 C.F.R. § 117.200(c). A summary of survival craft requirements for other small passenger vessels appears at 46 C.F.R § 180.200(c).

guidance, take into consideration variables such as the vessel's route and plans to operate in cold water, overnight accommodations, and hull material.

Cold Water Areas Determination Guidance. Coast Guard NVIC 7-91 outlines geographic areas determined to be cold water (59 degrees Fahrenheit and below) for applying lifesaving equipment regulations. Specifically, Coast Guard regulations may require commercial vessels that operate in cold waters to carry additional or different types of survival craft to better protect people immersed in water from the risk of hypothermia. NVIC 7-91 states that the Coast Guard used NOAA water temperature data to identify which areas off the U.S. coastlines and within the Great Lakes are designated as cold waters for each month of the year. According to the guidance, some waters are designated as cold throughout the year, while others may change during the year. For example, in the Pacific Ocean, the water areas surrounding Alaska are designated as cold through the year, while in the Atlantic Ocean, the cold water area changes during the year from north of Cape Hatteras, North Carolina in January to north of Cape Charles, Virginia in May.

Vessel Inspections. The Coast Guard conducts vessel inspections to ensure, among other things, that a vessel is equipped with the proper lifesaving and fire protection appliances prescribed by regulation.[26] In addition to inspecting vessels, the Coast Guard reviews and approves vessel plans and specifications, which includes ensuring that vessel owners adhere to lifesaving equipment requirements.

The Coast Guard Office of Commercial Vessel Compliance is responsible for developing and implementing policy and standards for commercial vessel inspections and examinations. Coast Guard field units, known as

[26]The inspections must also be sufficient to determine if the vessel is suitable for the service and route(s) in which it is to be employed, has suitable accommodations for passengers and crew, is in a condition to warrant the judgment that it may be used in navigation with safety to life, property, and the environment, and fully complies with the requirements of applicable statutes and regulations, including those for pollution prevention and navigation safety in all other respects. Coast Guard, *U.S. Coast Guard Marine Safety Manual, Volume II: Material Inspection,* COMDTINST 16000.7B Change 2 (Washington, D.C.: July 2016).

sectors, have responsibility for conducting these activities.[27] Additionally, the Coast Guard is responsible for approving the use of equipment or materials, such as lifesaving equipment. To be Coast Guard-approved, lifesaving equipment must, for example, comply with Coast Guard design requirements, and the equipment manufacturer must successfully complete specified tests to demonstrate that the equipment meets any applicable carriage and arrangement requirements. Coast Guard sector officials use NVIC 7-91 to guide how they inspect and certify that commercial vessels are meeting lifesaving equipment requirements that are based, in part, by the water temperature determinations for an area.

Accident investigations. The Coast Guard conducts investigations into vessel accidents that occur in U.S. waters or involve U.S. flagged vessels or citizens worldwide. It does so to identify the cause of the accident and determine if, among other things, there should be changes to its regulations and standards to prevent future accidents. The Coast Guard is to document its investigations into MISLE—the service's primary data system for capturing and reporting operational information in support of most of its missions.[28] For example, when investigating vessel accidents that resulted in casualties due to water immersion, Coast Guard policy requires investigators to collect information and input it into MISLE. Such information includes the people and vessels involved in the accident and the number of casualties and damage to the vessel.

The Coast Guard has faced longstanding challenges in ensuring the quality of data in MISLE. In July 2020, we found that MISLE contained data errors and did not fully address the mission needs for Coast Guard units.[29] For example, we found that search and rescue activities were not always recorded in the correct sequence of events. We made four recommendations to address the system's issues, including two related to data errors. The Coast Guard concurred with the recommendations and

[27]The Coast Guard's field structure is organized under two area commands (Atlantic and Pacific). The two area commands oversee nine districts across the United States, which are further broken down across 37 sectors. Some Sectors have a Marine Safety Unit or Marine Safety Detachment–smaller field units–that also conduct marine safety functions. Each Coast Guard area command, district, and sector is responsible for managing its assets and accomplishing its mission within its geographic area of responsibility.

[28]MISLE is designed to collect, store, and disseminate data on vessels, cargoes, facilities, waterways, individuals, and organizations, as well as Coast Guard activities involving all of these entities.

[29]GAO, *Coast Guard: Actions Needed to Ensure Investments in Key Data System Meet Mission and User Needs*, GAO-20-562, (Washington, D.C.: July 16, 2020).

stated it planned to replace MISLE with another data system, among other actions, which we explain in greater detail later in this report.

Coast Guard Data Show Most People Survived Accidents, but Limited Data Exist to Assess Efficacy of Lifesaving Equipment

Coast Guard data showed that most people survived vessel accidents during fiscal years 2010 through 2019. Among other things, the available data on the use of lifesaving equipment showed that survivors used out-of-water survival craft more than in-water survival craft and other lifesaving equipment. Further, over half of accidents involved commercial fishing vessels. However, the Coast Guard data is limited with respect to information on people involved in accidents, affecting its ability to assess the efficacy of lifesaving equipment. For example, the Coast Guard's data contain information on the date of birth and potential disability for less than half of people involved in vessel accidents, and it contains the use of lifesaving equipment for just over half of them.[30]

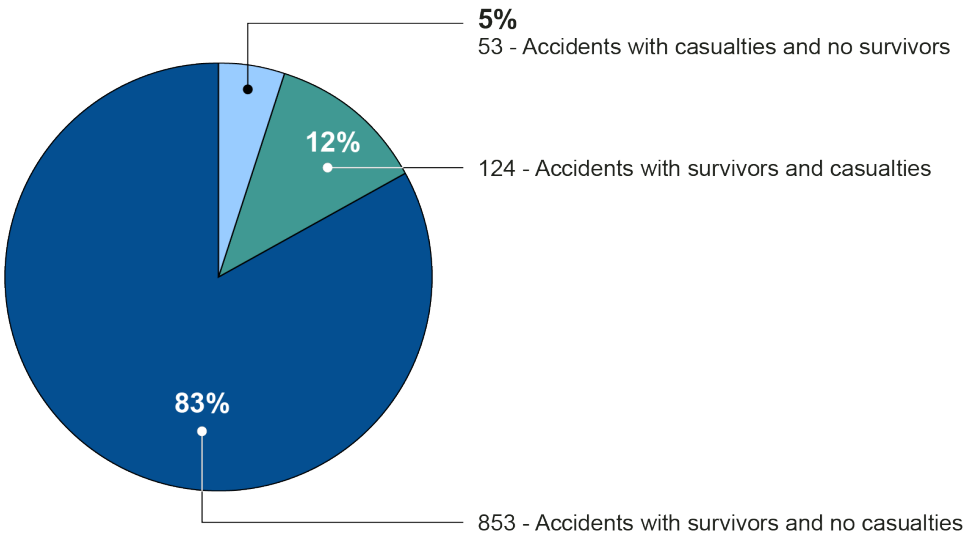
Coast Guard Data Show Over 3,800 People Survived Vessel Accidents and About a Third of Casualties Occurred from Water Immersion

Our analysis of Coast Guard MISLE data shows that 3,847 people survived vessel accidents, and nearly 83 percent of vessel accidents (853 of 1,030) did not result in any casualties during fiscal years 2010 through 2019. The remaining 17 percent of accidents (177 of 1,030) resulted in 352 casualties.[31] Of these 352 casualties, 129 occurred due to water immersion. Figure 2 shows the number of Coast Guard reported vessel accidents with survivors and casualties from fiscal years 2010 through 2019.

[30]To determine the number of people with potential disabilities who were casualties due to water immersion, we considered people that Coast Guard data described as having certain conditions—such as "hard of hearing"—as a person with a potential disability.

[31]Our analysis showed that few vessel accidents resulted in everyone on board becoming a casualty. Specifically, 177 out of 1,030 accidents (17 percent) of accidents had casualties. Of the 177 accidents with casualties, 53 accidents (five percent) of accidents resulted in everyone dying or going missing. The remaining 124 accidents (12 percent) of accidents had both survivors and casualties, such as the MISTRESS and TRINITY II. Further, not all casualties that resulted from vessel accidents occurred due to water immersion. For instance, five people survived after abandoning the small passenger vessel CONCEPTION that caught fire in Sector Los Angeles-Long Beach in September 2019. However, 34 casualties occurred because people could not abandon the vessel.

Figure 2: Number of Coast Guard Reported Vessel Accidents Involving Survivors and Casualties from Water Immersion, Fiscal Years 2010 through 2019



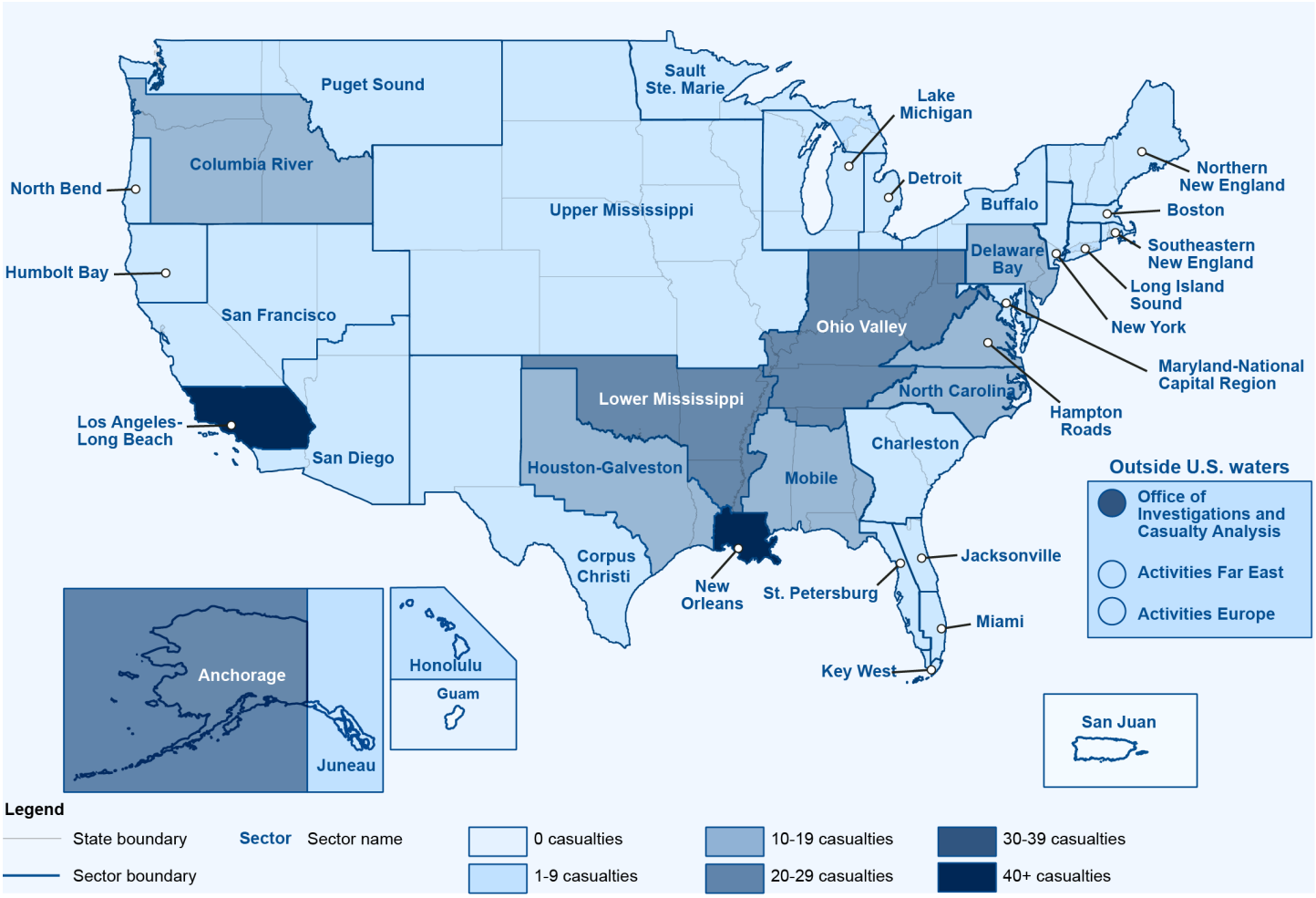
Source: GAO analysis of U.S. Coast Guard data. | GAO-21-247

Note: For the purposes of this report, we define a casualty as a person who died or went missing. We categorized vessel accidents into three groups based on the number of casualties: (1) accidents that did not result in casualties; (2) accidents when no one survived, resulting in only casualties; and (3) accidents involving multiple people where some survived and others became casualties. Not all casualties that resulted from vessel accidents occurred due to water immersion. For instance, five people survived after abandoning the small passenger vessel CONCEPTION that caught fire in Sector Los-Angeles-Long Beach in September 2019. However, 34 casualties occurred because people could not abandon the vessel.

According to Coast Guard MISLE data, casualties from vessel accidents involving water immersion occurred in almost all of the Coast Guard's 37 sectors during fiscal years 2010 through 2019. In particular, Sectors Los Angeles-Long Beach (43 casualties), New Orleans (40 casualties), and Upper Mississippi (23 casualties) had the most casualties.[32] Although Sector Guam and Sector San Juan had vessel accidents involving water immersion, neither sector reported casualties from them. Figure 3 shows the number of vessel accident casualties from water immersion across the Coast Guard's 37 sectors and three offices that investigate accidents outside U.S. waters.

[32] Not all casualties that resulted from vessel accidents occurred due to water immersion. For instance, five people survived after abandoning the small passenger vessel CONCEPTION that caught fire in Sector Los Angeles-Long Beach in September 2019. However, 34 casualties occurred because people could not abandon the vessel.

Figure 3: Number of Vessel Accidents Involving Water Immersion with Casualties, by Coast Guard Sector and Office, from Fiscal Years 2010 through 2019



Source: GAO analysis of U.S. Coast Guard data; MapInfo (map). | GAO-21-247

Note: Three Coast Guard components investigated U.S. flagged vessel accidents that occurred outside U.S. waters. They include the offices of (1) the Office of Investigations and Casualty Analysis, (2) Activities Far East, and (3) Activities Europe. The Office of Investigations and Casualty Analysis investigated one accident, the October 2015 sinking of the U.S.-flagged vessel EL FARO en route from Florida to Puerto Rico, which resulted in 33 casualties.

Not all vessel accident casualties occurred due to water immersion. For instance, five people survived after abandoning the small passenger vessel CONCEPTION that caught fire in Sector Los Angeles-Long Beach, in September 2019. However, 34 casualties occurred because people could not abandon the vessel.

Based on our analysis of the Coast Guard's data, we determined how casualties occurred, the types of vessels involved in most accidents, and the types of lifesaving equipment used by survivors.

About a Third of Casualties Occurred Outside the Vessel. Based on our analysis of Coast Guard data for 352 casualties following an accident, we found that about a third occurred outside the vessel due to water immersion. Specifically, 129 of 352 casualties occurred despite people escaping the vessel. We could not determine how the remaining 138 casualties from vessel accidents occurred.[33]

Over Half of Vessel Accidents Involved Commercial Fishing Vessels. Our analysis of Coast Guard data shows that, of the nine vessel types involved in accidents reported to the Coast Guard, commercial fishing vessel accidents represented about 51 percent of reported vessel accidents, 36 percent of survivors, and 33 percent of casualties due to water immersion. The second highest reported number of accidents (nearly 16 percent) involved other types of vessels that do not have survival craft requirements—such as non-commercial recreational vessels—which resulted in about 15 percent of survivors and 22 percent of casualties. Commercial small passenger vessel accidents resulted in about 28 percent of survivors and about 19 percent of casualties. See Appendix II for the number of vessels accidents, survivors, and casualties by vessel type.

Survivors Used Out-of-Water Survival Craft More Than Other Lifesaving Equipment. Based on our analysis of Coast Guard's available data on the use of lifesaving equipment, survivors used out-of-water survival craft most often (587 out of 3,847 survivors), followed by personal flotation devices (202 survivors), exposure or immersion suits (96 survivors), and then in-water survival craft (32 survivors).[34] However, the data shows that more people did not use lifesaving equipment to survive accidents. For example, 730 of the 1,197 survivors that did not use lifesaving equipment were rescued by the Coast Guard or nearby vessels.

[33]According to our review of Coast Guard MISLE data, cause of death was not always known. For example, the Coast Guard could not include cause of death for people who went missing and whose bodies were not recovered.

[34]We later discuss the limitations of the Coast Guard's MISLE data to determine how people in vessel accidents survived.

Lack of Information about People in Accidents Limits Coast Guard's Assessments of Lifesaving Equipment

We found that the Coast Guard's MISLE data has limited information to determine the extent of the number of casualties and survivors who are elderly and children, potentially disabled, and the type of lifesaving equipment they used. For example, the Coast Guard's data documented date of birth and potential disability for less than half of people involved in vessel accidents, and use of lifesaving equipment was included for just over half of them.

Children and the Elderly. The Coast Guard's MISLE data did not include date of birth information to calculate age for over 60 percent of people involved in vessel accidents. Specifically, our analysis found that the data did not have the date of birth for 2,359 of 3,847 survivors (61 percent) and 95 of 352 casualties (27 percent) from fiscal years 2010 through 2019. Based on available date of birth information, there were at least 117 elderly and 86 children in vessel accidents.[35] For the elderly, there were no casualties from small passenger vessel accidents, while most casualties (11 of 21) occurred on commercial fishing vessels. For children, small passenger vessels had the most survivors (44 of 77) and casualties (3 of 9).

Table 1 shows our analysis of Coast Guard data on the number of survivors (elderly and children) and casualties from water immersion, by vessel type, for fiscal years 2010 through 2019.

[35]According to our analysis of the Coast Guard's data, the remaining 1,315 survivors and 227 casualties with age information were adults.

Table 1: Coast Guard Data on the Number of Elderly and Children Vessel Accident Survivors and Casualties from Water Immersion, by Vessel Type, Fiscal Years 2010 through 2019

Vessel Type	Number of Children Survivors	Number of Children Casualties	Number of Children in Vessel Accidents	Number of Elderly Survivors	Number of Elderly Casualties	Number of Elderly in Vessel Accidents
Cargo Vessels	0	0	0	0	2	2
Commercial Fishing Vessels	9	2	11	18	11	29
Other Vessels[a]	19	2	21	17	5	22
Offshore Supply Vessels	0	0	0	1	0	1
Small Passenger Vessels	44	3	47	43	0	43
Towing Vessels	0	0	0	11	2	13
Unknown Vessels[b]	5	2	7	6	1	7
Total	**77**	**9**	**86**	**96**	**21**	**117**

Source: GAO analysis of Coast Guard data. | GAO-21-247

Note: Based on our analysis of available Coast Guard's MISLE data, the data had date of birth information to calculate age for less than half (1,745 of 4,199, or 42 percent) of people involved in vessel accidents. The table shows the number of children and elderly casualties and survivors based on available date of birth information.

[a]Other vessels include vessels that are not inspected and are not required to carry survival craft by the Coast Guard, such as a recreational vessel.

[b]Unknown vessels are those that Coast Guard data did not have enough information for GAO to classify.

The Coast Guard reported issues with the availability of age information in its 2013 *Survival Craft Safety* and 2017 *Non-Immersion Survival Craft* reports to Congress, both of which were required to include casualty information related to children and the elderly.[36] In its 2013 *Survival Craft Safety* report, the Coast Guard stated that age was generally not included and that it did not have the evidence to determine casualties or survivability of children or the elderly. Moreover, in its 2017 *Non-Immersion Survival Craft* report, the Coast Guard stated that it found age information for under a third (about 31 percent) of people involved in vessel accidents from January 1992 through December 2015. As such,

[36]The Coast Guard must update its analysis of the number of casualties involving children and the elderly as a result of water immersion every 5 years. Pub. L. No. 114–120, tit. III, § 301(b)(1)(A), (3), 130 Stat. at 50-51.

the Coast Guard reported using the limited information to estimate the potential number of casualties of children and the elderly.[37]

Potential Disability. We found only three of the 1,030 vessel accident records included information on potential disability of people involved in vessel accidents. This included one casualty of an elderly person with a potential disability and two people with potential disabilities who survived accidents. In its 2017 *Non-Immersion Survival Craft* report to Congress, the Coast Guard reported that there was not enough information to estimate the number of casualties that had potential disabilities, although this was a required element of its report.[38] Specifically, it reported that there were only two instances of potential disabilities reported from January 1992 through December 2015. For its 2013 *Survival Craft Safety* report to Congress, the Coast Guard stated it did not have the evidence to determine casualties or survivability of people with potential disabilities.

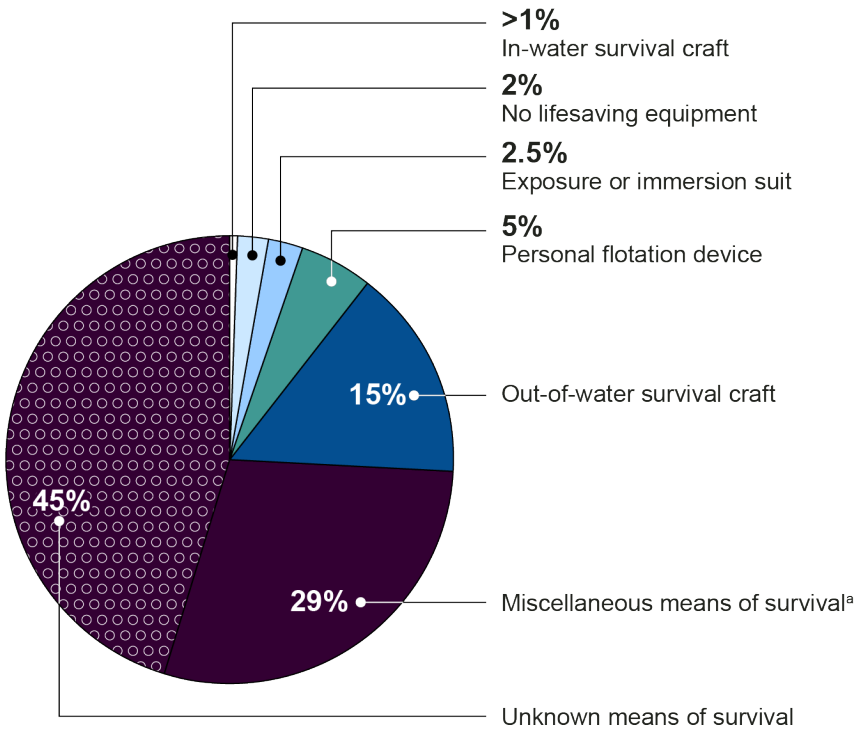
Use of Lifesaving Equipment. We found that Coast Guard data did not include the means of survival for approximately 45 percent (1,733 of 3,847) of survivors of vessel accidents from fiscal years 2010 through 2019, as shown in figure 4. Based on our analysis of the available information on survivors and the use of lifesaving equipment for 70 of the 352 casualties, out-of-water survival craft had the lowest casualty to survivor rate for survival craft. Specifically, out-of-water survival craft had a ratio of 587 survivors to one casualty, while in-water survival craft had a ratio of 32 survivors to three casualties.[39]

[37]Coast Guard's 2017 *Non-Immersion Survival Craft* report to Congress found that there was age information for 294 of 954 casualties from January 1992 through December 2015. According to the report, of the 294 people with age information, 14 were children and 30 were elderly. However, it estimated that there could have been three times that number—with as many as 45 children and 97 elderly casualties during that time.

[38]People with disabilities were the third group of people, besides children and the elderly,that the Coast Guard was required to address in its 2017 *Non-Immersion Survival Craft* report, with updates due to Congress every 5 years. Pub. L. No. 114–120, tit. III, § 301(b)(1)(A), (3), 130 Stat. at 50-51.

[39]Our analysis also found that 12 casualties occurred despite using exposure or immersion suits, 14 despite using personal flotation devices, and 40 without using lifesaving equipment.

Figure 4: Coast Guard Data on the Use of Lifesaving Equipment and Means of Survival by Vessel Accident Survivors, Fiscal Years 2010 through 2019



Source: GAO analysis of U.S. Coast Guard data. | GAO-21-247

[a]Miscellaneous means of survival includes abandoning the vessel directly onto rescuing Coast Guard vessels, other nearby vessels, rock jetties, ice floes, or attached craft such as a barge. It also includes using objects that are not types of lifesaving equipment, such as debris or other floating items, such as coolers.

The Coast Guard has limited information about people involved in vessel accidents because of two factors: data errors in MISLE and the Coast Guard not requiring its investigators to collect certain information.

Data Errors in MISLE. According to our analysis, the Coast Guard's MISLE data errors contributed to the limited information on age of vessel accident survivors and casualties. Data errors were due, in part, to the Coast Guard's incorrect classification of people, such as misclassifying a survivor of an accident as a witness, injured, or not at risk of becoming a

casualty.[40] For example, we found that MISLE data on about a third (1,266 of 3,847) of vessel accident survivors were either mislabeled or omitted. According to Coast Guard officials, some of the errors with classifying people in vessel accidents occurred in 2015 when Coast Guard upgraded MISLE. However, our analysis found that errors with classifying people persisted past 2015.

In July 2020, we found that MISLE contained data errors and recommended, among other things, the Coast Guard: (1) assess and address the causes of data errors and inconsistent entries; and (2) develop a plan for improving the consistency and accuracy of MISLE data.[41] The Coast Guard concurred with both recommendations. For the first recommendation, the Coast Guard stated that it would assess the data errors and inconsistencies reported by program offices and users to address their causes in the short-term and correct them in the long-term. The Coast Guard further stated that the assessment would include reviewing data validation processes and training, among other factors, to be completed by December 2021. For the second recommendation, the Coast Guard stated it would consider short-term modifications to MISLE to improve data consistency and accuracy, and in the long-term, replace MISLE to better meet the Coast Guard's needs.

Information Collection Not Required. The Coast Guard has limited information in part because it does not require investigators to collect information on date of birth, potential disability, and use of lifesaving equipment. Specifically, the Coast Guard's *Marine Investigations: Documentation and Reporting Procedures* guidance encourages investigators to collect date of birth and use of lifesaving equipment information, but it does not require that they do so. Moreover, collecting potential disability information is not mentioned in the guidance.

[40]Our analysis found that there were at least 4,199 people involved in vessel accidents from fiscal years 2010 through 2019. Coast Guard's MISLE data showed only 3,008 people involved in accidents during that time period. The Coast Guard's incorrect classification of people accounts for part of the difference. However, the Coast Guard also omitted people in accident records as well. According to Coast Guard guidance, every person involved in the accident should be included in the accident record. Other data issues we found included vessel type classification issues–shown as "unknown vessels" in table 1–and associating a casualty with an accident that did not occur.

[41]GAO-20-562.

According to Coast Guard headquarters officials, the goal of Coast Guard vessel accident investigations is to improve safety for all people, not to identify safety issues with specific demographic groups or better meet the service's Congressional reporting requirements.[42] They added that investigators' heavy workload may limit their ability to obtain additional information that is not required to be collected. However, Coast Guard headquarters officials from the Office of Investigations and Casualty Analysis told us that collecting age, potential disability, and usage of lifesaving equipment information could help the service assess risk. For instance, having that information could help identify trends that indicate another cause amongst different accidents or casualties that could be addressed by implementing regulatory changes or issuing safety bulletins. In addition, we discussed the usefulness of having information about people involved in accidents with officials from five Coast Guard sectors. Officials from all five sectors stated that having as much information—specifically date of birth—about a person would help identify if the same person was in multiple accidents and potentially the cause of the them.[43]

The Coast Guard's quality management system framework states that the Coast Guard should assess risk and review performance and effectiveness of its operations to ensure continual improvement to meet its marine safety mission.[44] Further, the Coast Guard's Marine Safety Manual states that an objective of an accident investigation is to collect as much information as possible to identify the cause of an accident or casualty.

According to Coast Guard reports and guidance, the service uses information from marine accidents to identify hazardous conditions or situations, conduct statistical analysis, and determine if new or revised safety laws, regulations, or policies are needed to prevent casualties. Specifically, the Coast Guard's 2017 *Non-Immersion Survival Craft* report to Congress stated that the service developed a risk-based approach to survival craft requirements using factors such as survivability and

[42]For example, a Coast Guard investigator may include information in MISLE that a person was hard of hearing if it resulted in a casualty because that person could not hear an alarm or announcement to abandon the vessel.

[43]For instance, a senior investigator from one sector stated that age could help distinguish whether the same person or two separate people with the same name were involved in different accidents.

[44]U.S. Coast Guard, *Mission Management System*, COMDTINST 5200.4A (Washington, D.C.: December 12, 2019).

casualty analysis. However, since the Coast Guard does not require investigators to collect date of birth, disability, and use of lifesaving equipment information, it has limited information to assess risks regarding the efficacy of lifesaving equipment.

Moreover, the Coast Guard Authorization Act of 2016 requires, among other things, that the Coast Guard report every 5 years on the number of casualties from water immersion involving people with disabilities, children, and the elderly, and what impact the carriage of out-of-water survival craft has on improving their survivability.[45] The Coast Guard highlighted this as a challenge in its 2013 *Survival Craft Safety* report to Congress, noting that its casualty reports were inconsistent in providing information about the usage of lifesaving equipment.

By revising its vessel accident investigations guidance to require investigators to collect date of birth, known disability, and use of lifesaving equipment of people in vessel accidents who were casualties due to water immersion, or who used lifesaving equipment, the Coast Guard would have more information available to assess the risks associated with the use of lifesaving equipment and more effectively meet its ongoing Congressional reporting requirements.

[45]Pub. L. No. 114–120, tit. III, § 301(b)(1)(A), (C)(ii), (3), 130 Stat. at 50-51.

The Coast Guard Estimated Costs and Benefits for Out-of-Water Survival Craft Requirements, but They Were Not Fully Accurate or Complete

Coast Guard Met Most Best Practices for Estimating Out-of-Water Survival Craft Requirements

The Coast Guard met most best practices in estimating the costs and benefits of requiring vessel owners to implement out-of-water survival crafts requirements[46] in the two required congressional reports we reviewed.[47] Specifically, the Coast Guard's 2013 *Survival Craft Safety* and 2017 *Non-Immersion Survival Craft* reports to Congress provided information that met eight of 10 OMB best practices and the corresponding GAO best practices.[48] However, we found that these reports did not provide information to meet two of them. Specifically, the Coast Guard's 2013 *Survival Craft Safety* and 2017 *Non-Immersion Survival Craft* reports to Congress did not discount future benefits and costs or document assumptions.

[46]The estimated costs of requiring vessel owners to implement out-of-water survival craft requirements are borne by the vessel owners while the estimated benefits would accrue to individuals who use out-of-water survival craft. For the purpose of this report, costs are the resources expended by vessel owners to replace life floats and buoyant apparatus with out-of-water survival craft, including recurring servicing expenses. Additionally for this report, benefits represent the reduction in fatality of individuals who use an out-of-water survival craft.

[47]For the applicable congressional reporting requirements, see Pub. L. No. 114–120, tit. III, § 301(b)(1)(C)(iii), 130 Stat. at 50-51 and Pub. L. No. 112-213, tit. III, § 303(2), 126 Stat. at 1563.

[48]As we discussed earlier, our analysis shows whether the Coast Guard's estimated costs and benefits of requiring vessel owners to carry out-of-water survival craft either "met" or "did not meet" an OMB or GAO best practice. According to GAO's assessment methodology for best practices, the Coast Guard's estimates "met" a best practice if the estimate considered and properly dealt with the element. Additionally, the Coast Guard's estimates "did not meet" a best practice if these estimates did not consider or properly address the element. See GAO-18-151SP. Appendix III provides a cross walk between OMB and GAO best practices for cost and benefit estimates and Appendix I provides an additional description for each practice.

We highlight selected findings below on the extent to which the Coast Guard's estimates met best practices. See Appendix III for more details on the extent the Coast Guard's practices for estimating the costs and benefits of survival craft in its 2013 *Survival Craft Safety* and 2017 *Non-Immersion Survival Craft* reports met OMB and GAO best practices.

Quantifying and Monetizing the Benefits and Costs

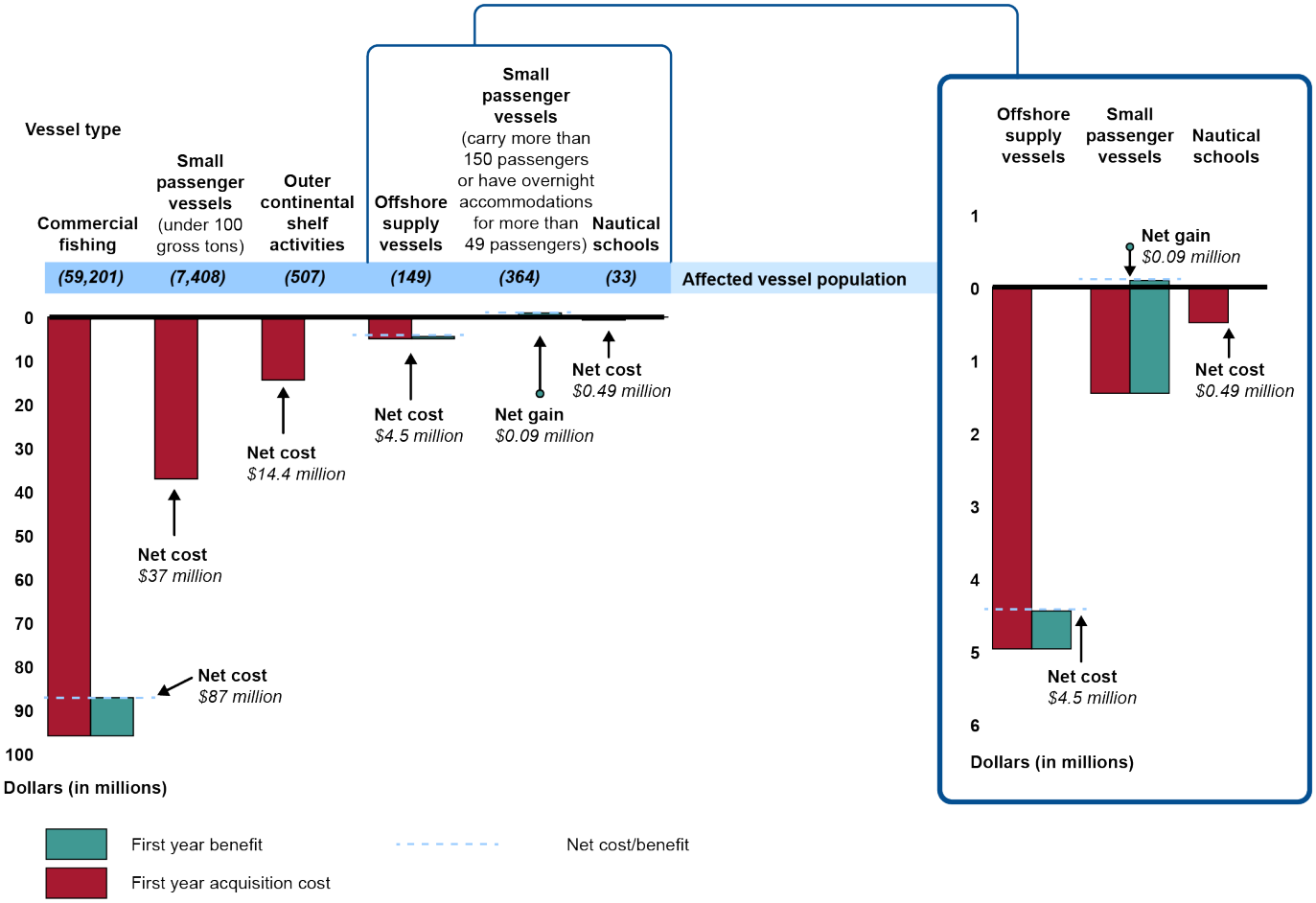
We consider that the Coast Guard's cost estimates largely met the best practice for quantifying and monetizing the benefits and costs to carry out-of-water survival craft. However, we also identified issues with the accuracy of the estimates, as discussed later. Our analysis showed that the Coast Guard monetized economic information to quantify the likely benefits and costs to carry out-of-water survival craft instead of in-water survival craft in the service's 2013 *Survival Craft Safety* and 2017 *Non-Immersion Survival Craft* reports to Congress.[49] For example, in 2013, the Coast Guard estimated that 67,662 vessels used in-water survival craft and would incur costs to acquire out-of-water survival craft, including an estimated number of commercial fishing vessels, small passenger vessels, sailing school vessels, offshore supply vessels, and outer continental shelf activities.

The Coast Guard projected the first-year acquisition costs, as well as the costs and benefits across a 10-year period. The 2013 *Survival Craft Safety* report concluded that the total net costs—about $143.5 million—exceeded the total net benefits by about $10.8 million. The Coast Guard found that there was a net benefit for one of the six vessel types that would be affected by an out-of-water survival craft requirement—small passenger vessels that carry more than 150 passengers or have overnight accommodations for more than 49 passengers. However, the Coast Guard concluded that an out-of-water survival craft requirement would not likely have a significant positive effect on passenger safety.

Figure 5 shows the Coast Guard's 2013 cost and benefit estimates for implementing out-of-water survival requirements for the first year, by vessel type.

[49]Coast Guard provided key information in its estimates of costs and benefits of implementing out of water survival crafts as required in OMB's and GAO's best practices. According to OMB's best practices, an agency should use the best reasonably obtainable economic information to quantify the likely benefits and costs of each regulatory alternative and an appropriate value of statistical life in the benefits calculation. According to GAO's best practice, where feasible, an economic analysis should quantify the important economic effects and monetize them using the concept of opportunity cost.

Figure 5: The Coast Guard's 2013 Cost and Benefit Estimates for Implementing Out-of-Water Survival Requirements for the First Year, by Vessel Type



Source: GAO analysis of U.S. Coast Guard documentation. | GAO-21-247

Note: The estimated costs of requiring vessel owners to implement out-of-water survival craft requirements are borne by the vessel owners while the estimated benefits would accrue to individuals who use out-of-water survival craft. For the purpose of this report, costs are the resources expended by vessel owners to replace life floats and buoyant apparatus with out-of-water survival craft, including recurring servicing expenses. Additionally for this report, benefits represent the reduction in fatality of individuals who use an out-of-water survival craft.

The Coast Guard's first year estimated costs and benefits varied for each vessel type based on the number of affected vessels and types of required out-of-water survival crafts, among other things. For example, according to Coast Guard estimates, commercial fishing vessels had the highest number of affected vessels (59,201 vessels) and subsequently the highest first-year acquisition costs ($96 million), benefits ($9 million),

and net costs (over $87 million). Conversely, the Coast Guard estimated that sailing schools had the lowest number of affected vessels (33 vessels) with estimated first-year acquisition costs totaling about $485,000 and no benefits.

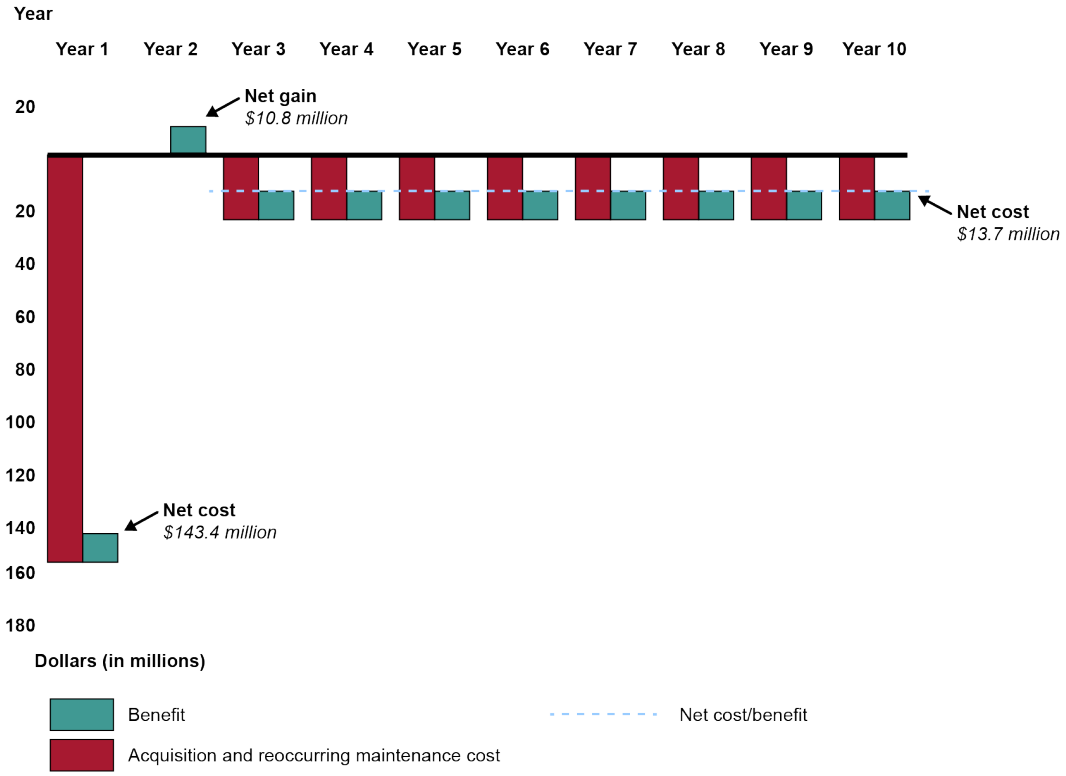
Further, the Coast Guard estimated the number of affected vessels, costs, and benefits for small passenger vessels including those that carried more than 150 passengers or with overnight accommodations for more than 49 passengers, and those that did not. For those that did not, the Coast Guard estimated that an affected 7,408 small passenger vessels would have over $37 million in first-year acquisition costs and zero benefits. For the estimated 364 small passenger vessels in the other group, the Coast Guard estimated that there would be $1,459,902 in first-year costs and $1,548,540 in first-year benefits, resulting in a net gain of over $88,638.

Also, in its 2013 *Survival Craft Safety* report to Congress, the Coast Guard projected the costs and benefits of implementing out-of-water survival crafts for each year over a 10-year period. Overall, the Coast Guard estimated that the costs exceeded the anticipated benefits by more than $240 million over the course of 10 years. Specifically, the Coast Guard estimated that the costs, which included recurring servicing costs, over the course of 10 years, totaled $350.2 million. The potential benefits over the course of 10 years, such as the reduction in fatality of people who use an out-of-water survival craft, totaled about $108.4 million. The Coast Guard estimated net costs for each of the 10 years, including initial acquisition costs in year 1 and following maintenance costs in years 2 through 10. For year 2, the Coast Guard estimated that there would be no maintenance costs.[50]

Figure 6 shows Coast Guard's 2013 cost-effectiveness analysis for implementing out-of-water survival requirements for a 10-year-period, by year.

[50]For Year 1, Coast Guard estimated the costs to be over $154 million, the benefits to be nearly $11 million, and net costs to be over $143 million. For Year 2, Coast Guard estimated that the costs decreased to zero and the benefits remained nearly $11 million which resulted in a net gain of about $11 million. For the remaining years (i.e. Years 3 through 10), Coast Guard estimated the costs to be over $24 million, nearly $11 in benefits and nearly $14 million in net costs.

Figure 6: The Coast Guard's 2013 Cost-Effectiveness Analysis for Implementing Out-of-Water Survival Craft Requirements for 10 Years, By Year



Source: GAO analysis of U. S. Coast Guard documentation. | GAO-21-247

In its 2017 *Non-Immersion Survival Craft* report to Congress, the Coast Guard also provided first-year acquisition costs per vessel in its estimates of costs and benefits of implementing an out-of-water survival craft requirement. According to the 2017 *Non-Immersion Survival Craft* report, the initial cost per vessel of acquiring out-of-water survival craft varied from approximately $3,000 to $8,000 depending on vessel type. The Coast Guard also estimated that annual servicing of out-of-water survival craft would cost $810 per year per vessel. Additionally, the Coast Guard estimated that approximately 3,212 small passenger vessels owned by small businesses and non-profit entities could be affected by a requirement to carry out-of-water survival craft. In its 2017 *Non-Immersion Survival Craft* report to Congress, the Coast Guard did not project the initial acquisition costs for the total affected vessels as it did in its 2013 Survival Craft Safety report to Congress.

Coast Guard Underestimated Benefits, Overestimated Net Costs, and Did Not Adequately Document Assumptions

We found that the Coast Guard's 2013 *Survival Craft Safety* and 2017 *Non-Immersion Survival Craft* reports to Congress did not provide information to address all OMB and corresponding GAO best practices. Specifically, the reports did not address two of 10 OMB best practices—to discount future benefits and costs and document methods. As a result, the reports contained inaccurate and incomplete information on the costs and benefits of requiring vessel owners to have certain survival craft.

Discount future benefits and costs

According to OMB's best practice to discount future benefits and costs, an agency should use discounting to provide an accurate assessment of benefits and costs that occur at different points in time.[51] The OMB best practices also state that in presenting a stream of benefits and costs, it is important to measure them in constant dollars to avoid misleading effects of inflation.[52] Additionally, GAO's "analysis of effect" best practice states that the analysis applies the criterion of net present value, or related outcome measures, to compare these effects across alternatives, and controls for inflation and uses economically justified discount rates.

Insufficient control for inflation. Our analysis showed that the Coast Guard relied on outdated inflation information when estimating benefits and costs in its 2013 *Survival Craft Safety* report to Congress. For example, the Coast Guard used the value of statistical life data from 2007 to estimate the benefits of requiring vessel owners to carry out-of-water survival craft but did not adjust for inflation to reflect conditions as of 2013.[53] As a result, the Coast Guard overestimated the net costs of implementing out-of-water requirements by approximately $10.9 million, or 4 percent.[54] The Coast Guard's 2017 *Non-Immersion Survival Craft* report to Congress, unlike the 2013 report, did not provide a detailed analysis of the estimated costs and benefits of vessel owners carrying out-of-water survival craft.

No use of economically justifiable discount rates. Our analysis showed that, in its 2013 *Survival Craft Safety* report to Congress, the

[51]Appendix I provides a more detailed description of discounting.

[52]OMB, *Circular A-4, Regulatory Analysis* (Washington, D.C.: 2003).

[53]Value of statistical life is the amount society would be willing to pay to reduce the probability of death but does not represent the dollar value of a person's life.

[54]This is based on adjusting the yearly benefits from approximately $10.8 million in 2007 dollars to about $11.9 million in 2013 dollars for each of the 10 years using the Gross Domestic Product deflator.

Coast Guard estimated the cost-effectiveness of requiring vessel owners to carry out-of-water survival craft over a 10-year time span. However, it did not use economically justifiable discount rates to account for the time value of money over this time span.[55] As a result, the net costs in its estimates were approximately $32.3 million (13 percent) higher than if the Coast Guard had used justifiable discount rates.[56] The 2017 *Non-Immersion Survival Craft* report also did not include cost estimates with justifiable discount rates. The Coast Guard's 2017 *Non-Immersion Survival Craft* report to Congress, unlike the 2013 report, did not provide a detailed analysis of the estimated costs and benefits of vessels carrying out-of-water survival craft.[57]

Document Methods

According to OMB's best practices, an agency should clearly document all of the assumptions and methods used in the analysis, discuss the uncertainties associated with estimates, and publicly provide the supporting data and underlying analysis. Additionally, GAO's transparency best practice states that the economic analysis should describe and justify the analytical choices, assumptions, and data used. Furthermore, DHS *Information Quality Guidelines* state that DHS components, such as the Coast Guard, should include a high degree of transparency about data and methods to facilitate the reproducibility of such information by qualified third parties when disseminating financial statistical information.[58]

Our analysis showed that, in its 2013 *Survival Craft Safety* report to Congress, the Coast Guard did not clearly document or justify all the methods used to calculate the estimated costs for vessel owners to purchase and install out-of-water survival craft. For example, the Coast Guard did not document the number and type of survival craft it estimated each vessel type would need. As a result, it is unclear how the Coast

[55]Time value of money means that money is worth more in the present than it is in the future because it has the potential to earn interest. Essentially, benefits or costs that occur sooner are generally more valuable.

[56]We used a real discount rate of 7 percent and treated the future benefits and costs as 2013 dollars. More generally, OMB Circular A-4 recommends the 7 percent discount rate as a broad measure for evaluating public investments and regulations.

[57]Combined, the net costs in its estimate were about $40.5 million (17 percent) higher than if the Coast Guard had controlled for inflation for the benefits and used justifiable discount rates.

[58]Department of Homeland Security, *Information Quality Guidelines*, (Washington, D.C.: 2011).

Guard calculated these estimates and if the estimates reported to Congress on first-year acquisition cost estimates was accurate.

A Coast Guard headquarters official from the Standards Evaluations & Analysis Division told us that the value of statistical life data the Coast Guard received from DHS for its 2013 *Survival Craft Safety* report was from 2007. The official stated that DHS had not updated it between 2008 and 2013 because this value is periodically, not annually, adjusted to the current year inflation. Nonetheless, OMB and GAO best practices state the value of statistical life data should be adjusted for inflation when an agency prepares a cost and benefit estimate, which the Coast Guard did not do for its 2013 estimates. As an example of the need to adjust for inflation, in the Coast Guard's 2013 survival craft report, the designated value of $6.3 million in 2007 was based on a value of $4.7 million in 1997 dollars that had been adjusted for real income growth as well as inflation.[59]

Coast Guard headquarters officials acknowledged they do not know why the Coast Guard's 2013 cost estimates reported to Congress did not use economically justifiable discount rates or document methods. They said they did not have historical documents outlining the methods the Coast Guard used in the 2013 and 2017 cost estimates because the staff who prepared these estimates no longer work at the Coast Guard and did not document their estimates. Without the historical documentation, headquarters officials said, current Coast Guard staff is not able reconstruct the methods that the Coast Guard made in the prior estimates and reports to Congress.

The Coast Guard has an ongoing responsibility under the Coast Guard Authorization Act of 2016 to report to Congress on the costs and cost effectiveness of requiring vessels to carry out-of-water survival craft, with updates due every 5 years.[60] By fully implementing OMB and GAO best practices for estimating costs and benefits, including controlling for inflation and using justifiable discount rates, and documenting its methods, the Coast Guard can better ensure its future estimates are accurate and complete—and can be used for determining whether, and to

[59]Robinson, L.A. *Valuing Mortality Risk Reductions in Homeland Security Regulatory Analyses,* Prepared for U.S. Customs and Border Protection, Department of Homeland Security (June 2008)

[60]Pub. L. No. 114–120, tit. III, § 301(b)(1)(C)(iii), (3), 130 Stat. at 50-51.

what extent, the benefits outweigh costs for requiring commercial vessels to carry out-of-water survival craft.

Coast Guard Guidance for Determining Cold Water Areas Does Not Reflect Best Available Data

Coast Guard guidance for determining cold water areas and corresponding commercial vessel lifesaving equipment requirements is based, in part, on outdated water temperature data. As discussed, the 1991 guidance, NVIC 7-91, is intended to support both vessel operators and Coast Guard sector officials in determining which vessels are subject to lifesaving equipment requirements that apply to cold water (59 degrees Fahrenheit and below). Under applicable Coast Guard regulations, commercial vessels that operate in cold waters must carry additional or different types of survival craft to better protect people immersed in cold water against the risk of hypothermia. The guidance references NOAA water temperature data to identify which areas off the U.S. coastlines and within the Great Lakes are designated as cold waters for each month of the year. According to the guidance, some waters are designated as cold throughout the year, while others may change during some months.

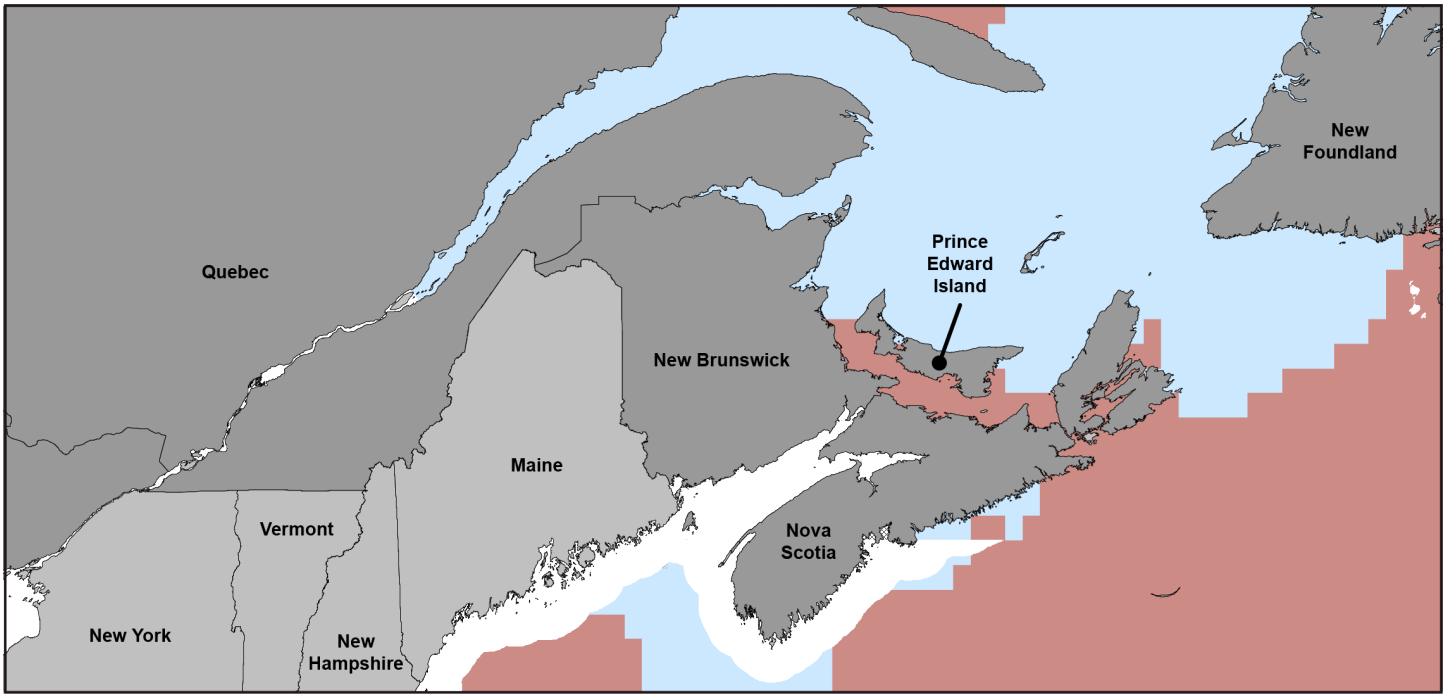
Our analysis of NOAA temperature data for 2005 through 2017—the most recent long-term water temperature data period available—found that water temperatures off both the U.S. Atlantic and Pacific coasts for almost all months did not match the cold water determinations in the Coast Guard's 1991 guidance.[61] In particular, data show that water temperature increased above 59 degrees Fahrenheit off the Atlantic coast for all months and Pacific coast for 10 months of the year relative to the Coast Guard's guidance. For example, the data show that, for the month of September, waters measuring over 59 degrees Fahrenheit (in other words not "cold" per NVIC 7-91) expanded across almost half the area in the Gulf of Maine designated as "cold water" in 1991. Warmer waters also expanded offshore and across much of the coast of Nova Scotia, Canada in the Atlantic Ocean and above Washington State in the Pacific Ocean.

Figure 7 shows how water temperatures in the Northeast Atlantic Ocean, for the month of September between 2005 through 2017, compare to those outlined in the Coast Guard's 1991 cold water determination guidance. Specifically, it shows that, according to NOAA water

[61]Specifically, we analyzed water temperatures off the U.S. coast in the Atlantic Ocean and Pacific Ocean for all months from 2005 through 2017. We used the water temperature data from NOAA's 2018 *World Ocean Atlas*. See: Locarnini, R. A., A. V. Mishonov, O. K. Baranova, T. P. Boyer, M. M. Zweng, H. E. Garcia, J. R. Reagan, D. Seidov, K. Weathers, C. R. Paver, and I. Smolyar, 2018. *World Ocean Atlas 2018, Volume 1: Temperature.* A. Mishonov Technical Ed.; NOAA Atlas NESDIS 81, 52 pp.

temperature data for the years 2005 through 2017, areas measuring over 59 degrees Fahrenheit (warm water) have increased since the Coast Guard established the cold water boundaries in its 1991 guidance.

Figure 7: Water Temperature Changes in the Coast Guard's Designated Cold Water Areas for the Month of September in the Northeast Atlantic Ocean

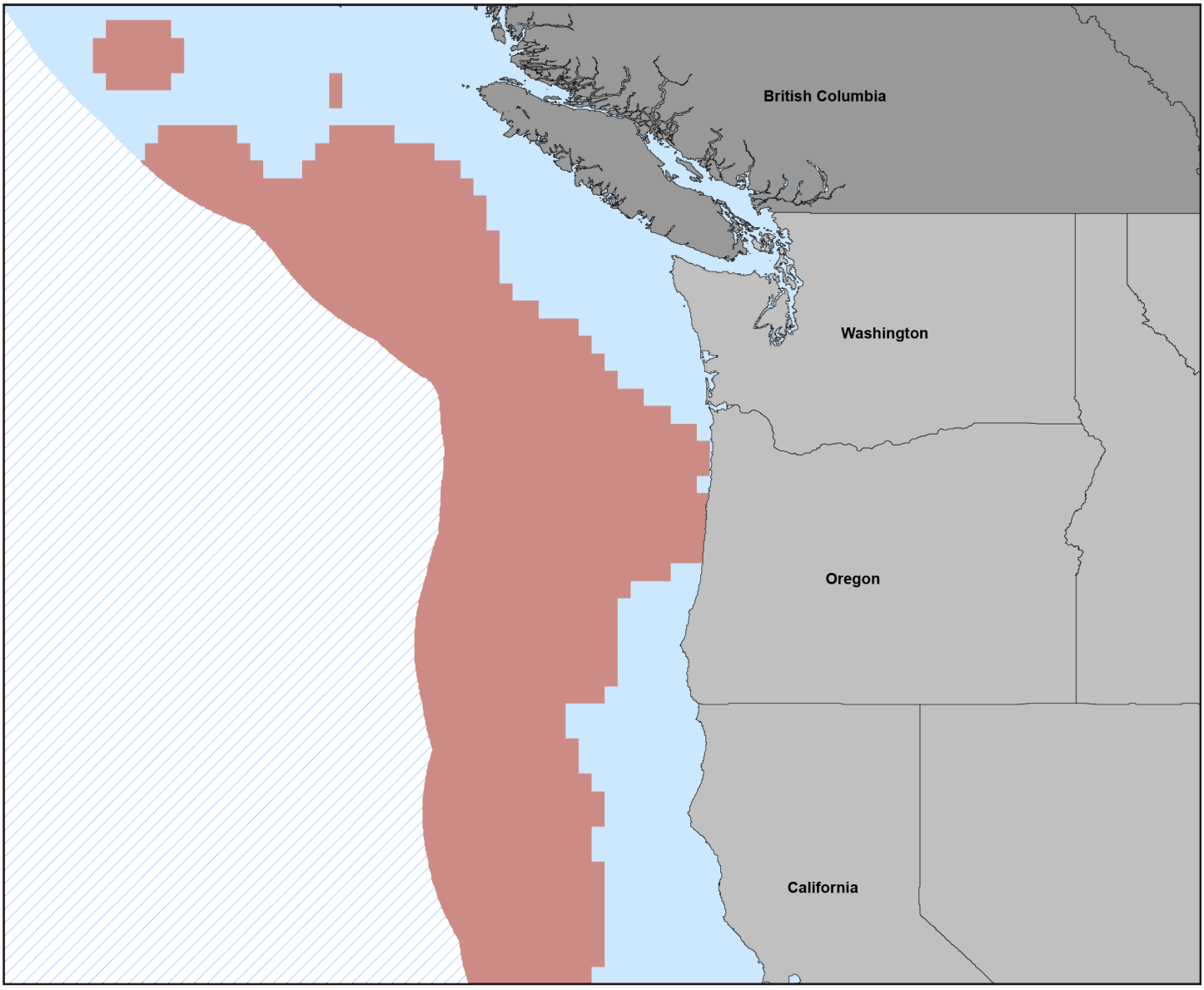


Source: GAO analysis of Coast Guard guidance and National Oceanic and Atmospheric Administration data. | GAO-21-247

Note: The Coast Guard's 1991 Navigation and Inspection Circular 7-91 guidance designated areas as cold water—59 degrees Fahrenheit or below—for the month of September in the Atlantic Ocean. The guidance also specifies certain areas that are not within the cold water area. However, as shown in this figure, our analysis of National Oceanic and Atmospheric Administration data for 2005 through 2017 showed that water temperatures measured above 59 degrees Fahrenheit within the Coast Guard's cold water area for the month of September.

Figure 8 shows how water temperatures in the Pacific Ocean, for the month of September, between 2005 through 2017, compare to those outlined in the Coast Guard's 1991 cold water determination guidance. Specifically, it shows that, according to NOAA water temperature data for the years 2005 through 2017, areas measuring over 59 degrees Fahrenheit (warm water) have increased since the Coast Guard established the cold water boundary in its 1991 guidance.

Figure 8: Water Temperature Changes in the Coast Guard's Designated Cold Water Areas for the Month of September for the Pacific Ocean



Source: GAO analysis of Coast Guard guidance and National Oceanic and Atmospheric Administration data. | GAO-21-247

Note: The Coast Guard's 1991 Navigation and Inspection Circular 7-91 guidance designated areas as cold water—59 degrees Fahrenheit or below—for the month of September in the Pacific Ocean. The guidance also specifies certain areas that are not within the cold water area. However, as shown in

this figure, our analysis of National Oceanic and Atmospheric Administration (NOAA) data for 2005 through 2017, showed that water temperatures measured above 59 degrees Fahrenheit within the Coast Guard's cold water area for the month of September.

[a]We limited our water temperature analysis of NOAA's water temperature data to 200 miles off the coastline.

Beyond the temperature differences we found in comparing the NOAA data with the 1991 guidance, the Coast Guard found that water temperatures have changed in some areas. Specifically, Coast Guard sector commanders have flexibility to revise cold water determinations in their area of responsibility, and two of the six sectors we met with had done so. Coast Guard commanders of Sectors Maryland–National Capital Region and North Carolina examined water temperatures and changed the cold water season for their sectors in both 2001 and 2014.[62]

Nevertheless, Coast Guard officials from the Office of Commercial Vessel Compliance told us they had not identified a need to revise the cold water determination guidance. For example, they said they generally would review a marine safety policy or guidance for potential revision based on whether they receive field office or public input. They said such input may include a corrective action report from a sector, district, or area command or input from commercial vessel owners or industry groups. However, officials told us the service had not re-examined the accuracy of the water temperatures in the cold water determination guidance, in part, because no one from the Coast Guard or the public had raised issues with it.

The Coast Guard has generally not had a process in place to routinely review the cold water determination process for accuracy. Coast Guard officials noted that the service had implemented an effort in recent years to routinely review its marine safety policies but had not identified cold water determination guidance as a policy in need of revision.[63] Office of Commercial Vessel Compliance officials told us the goal of the effort was to determine if marine safety policy and guidance needed an update or rescission. However, the officials said they are still reviewing marine

[62]U.S. Coast Guard Sector Maryland-National Capital Region, *Cold Water Determination for Vessels Operating in the OCMI Baltimore Zone*, Inspection Note 16700 (Baltimore: May 15, 2001). U.S. Coast Guard Sector North Carolina, *Clarification of Cold Water Months in Sector North Carolina Zone*, Inspection Note 05 (Wilmington: December 5, 2014).

[63]According to a 2017 Coast Guard memorandum, the Coast Guard initiated a process in 2017 at headquarters that includes, amongst other things, a review of the service's marine safety policies. See U.S. Coast Guard, *Mission Management System (MMS) Headquarters Implementation Plan*, Memorandum 16000 (Washington, D.C.: April 25, 2017).

safety policies and had not identified the guidance as a policy necessitating update. They noted the process was ongoing, though they did not have documentation on its status.

Coast Guard strategic documents identify that the service and commercial vessels will have to adapt their operations due to changing water temperatures. For example, the Coast Guard's 2019 Arctic Strategy recognizes that water temperatures are rising in the Arctic and the associated environmental changes will affect commercial vessel operations and safety in the region. Moreover, DHS *Information Quality Guidelines* state that quality information should be based on the most recent scientific information.[64] Additionally, *Standards for Internal Control in the Federal Government* states that agencies should regularly analyze and respond to change, and periodically review policies, procedures, and related control activities for continued relevance and effectiveness in achieving the entity's objectives or addressing related risks.[65]

NOAA officials from the National Centers for Environmental Information told us they were not aware of communications with the Coast Guard on the cold water determination guidance. However, officials suggested that, for the purpose of the cold water determination guidance, water temperatures should be analyzed every 10 years because NOAA is continuously increasing its capabilities for measuring water temperatures. Specifically, they said a 10-year time frame would allow cold water determinations to take into account technological and operational advances in temperature monitoring that result in better measurements and analysis. Moreover, NOAA officials recommended using the lowest observed temperature measurement instead of the low monthly mean measurement—as the Coast Guard used in its 1991 guidance—to determine cold water areas.[66]

By reviewing its cold water areas determination guidance to determine if it reflects current water temperature data, and if necessary revising it, the

[64]Department of Homeland Security, *Information Quality Guidelines* (Washington, D.C.: 2011).

[65]GAO-14-704G.

[66]According to NOAA officials, using lowest observed temperature is the best scientific available data compared to lowest monthly mean. This is because there may not be enough water temperature measurements to know if the mean is an accurate statistic. Further, water temperatures in the ocean and the coasts are subject to temperature shifts every decade. Using the lowest observed temperature takes into account the natural cycles in ocean climatology that may occur on decadal timescales.

Coast Guard would better ensure that commercial vessels are operating with appropriate lifesaving equipment for their operating areas and Coast Guard has quality information to guide its vessel inspections. Moreover, establishing a process to routinely review the guidance to ensure its cold water determinations reflect current water temperatures would ensure that the Coast Guard provides accurate and timely guidance to both the Coast Guard inspectors and commercial vessel operators in the future.

Conclusions

The Coast Guard is responsible for ensuring that the U.S. flagged commercial vessel fleet has the appropriate lifesaving equipment onboard to reduce the risk of casualties following an accident. To carry out this responsibility, the Coast Guard conducts casualty and cost estimate analyses to create or, if appropriate, amend lifesaving equipment regulations and policies. One of the main information sources the Coast Guard uses is information collected from vessel accident investigations, particularly if there was a casualty. However, the Coast Guard has collected limited information on people involved in accidents, specifically their use of lifesaving equipment, date of birth, and potential disability. Without complete information, the Coast Guard can neither fully assess the efficacy of lifesaving equipment regulations nor provide a robust analysis in responding to an ongoing congressional requirement. By collecting date of birth, known disability, and use of lifesaving equipment of people in vessel accidents who were casualties due to water immersion or used lifesaving equipment the Coast Guard could better assess the risks associated with the use of lifesaving equipment. Similarly, by fully implementing OMB and GAO best practices, the Coast Guard could better understand the costs and benefits of changing requirements on the use of lifesaving equipment.

Notably, a key input when considering the appropriateness and costs of different lifesaving equipment is the conditions under which such equipment is to be used, and in this regard, the Coast Guard's guidance for determining cold water areas and associated lifesaving equipment requirements is outdated. Water temperatures have changed at certain places and during certain times since 1991, when the Coast Guard issued the guidance. By reviewing its cold water areas determination guidance to determine if it reflects current water temperature data and, if necessary, revising it, the Coast Guard would better ensure that commercial vessels are operating with appropriate lifesaving equipment for their operating areas and has quality information to guide its vessel inspections. Moreover, establishing a process to routinely review the guidance to ensure that its cold water determinations reflect current water temperatures would ensure that the Coast Guard provides accurate and

timely guidance to both Coast Guard inspectors and commercial vessel operators in the future.

Recommendations for Executive Action

We are making the following four recommendations to the Coast Guard:

The Commandant of the Coast Guard should ensure that the Director of Inspections and Compliance revises its vessel accident investigations guidance to require Coast Guard investigators to collect date of birth, known disability, and use of lifesaving equipment of people in vessel accidents who were casualties due to water immersion, or who used lifesaving equipment. **(Recommendation 1)**

The Commandant of the Coast Guard should ensure that the Director of Commercial Regulations and Standards fully implements OMB and GAO cost and benefit estimate best practices in developing future estimates of the implementation costs for out-of-water survival craft requirements, including relying on the most current inflation information and discounting future costs and benefits for cost effectiveness projections, and documenting its methods for calculating acquisition costs. **(Recommendation 2)**

The Commandant of the Coast Guard should ensure that the Director of Inspections and Compliance analyzes its cold water determinations using the best available long-term water temperature data and, if appropriate, update its cold water areas determination guidance for certain lifesaving equipment requirements on commercial vessels. **(Recommendation 3)**

The Commandant of the Coast Guard should ensure that the Director of Inspections and Compliance establishes a process to routinely review and update, if appropriate, its cold water areas determination guidance for certain lifesaving equipment requirements on commercial vessels using the best available temperature data. **(Recommendation 4)**

Agency Comments and our Evaluation

We provided a draft of this report to the Department of Commerce and DHS for comment. The Department of Commerce did not have any comments. On March 5, 2021, DHS provided comments, reproduced in full in appendix IV. DHS concurred with three of our four recommendations and described actions planned to address them, but did not concur with the remaining recommendation. DHS also provided technical comments, which we incorporated as appropriate.

DHS did not concur with our first recommendation that the Coast Guard revise its vessel accident investigations guidance to require Coast Guard

investigators to collect date of birth, known disability, and use of lifesaving equipment of people in vessel accidents who were casualties due to water immersion, or who used lifesaving equipment. In its comments, DHS stated that Coast Guard Marine Casualty Investigating Officers are not required by statute or regulation to collect date of birth, known disability, and use of lifesaving equipment of people in vessel accidents who were casualties due to water immersion, or who used lifesaving equipment. It stated that Investigating Officers already collect this type of information on a case-by-case basis when the information is needed for a specific investigative purpose, such as when an officer determines that an involved subject's disability was a contributing factor to a marine casualty.

With respect to these concerns, we do not believe the lack of statutory or regulatory requirements prevents the Coast Guard from issuing requirements for its investigators to collect date of birth, known disability, and use of lifesaving equipment information of people in vessel accidents who were casualties due to water immersion, or who used lifesaving equipment. The Coast Guard routinely issues guidance to its personnel to take certain actions—such as through Commandant Instructions and Tactics, Techniques, and Procedures—and the requirements are not all outlined in statute and regulation. This includes the Coast Guard's current marine investigations reporting procedures that detail the information investigators are to collect.

Moreover, under its existing accident investigation procedures, the Coast Guard requires investigators to collect information on all parties directly involved in the casualty incident. It calls for entering as much information as is known, including name, gender, and date of birth for those with direct involvement in the accident. Notably, it states that investigators are to determine whether survivors involved in the accident were at risk of being killed or injured. In this way, requiring the collection of information on survivors known disability, date of birth, and use of lifesaving equipment would support the investigators' efforts to make this determination—while supporting the Coast Guard's efforts to assess the sufficiency of its survival craft requirements.

DHS also stated in its comments that birth dates associated with documenting a person's age are protected by Personally Identifiable Information requirements. It stated that, specifically, per DHS Directive 047-01, Privacy Policy and Compliance, dated July 7, 2011, the Department should only collect Personally Identifiable Information that is directly relevant and necessary to accomplish the specified purpose. It stated that mandating collection of this type of information in all cases

subject to this recommendation (even those where the information is not relevant to a contributing factor of an investigation) would be improper and, even if construed as proper, it would be overly burdensome and impractical, and would not add any significant benefit to the investigative process.

We recognize the Coast Guard's concern about collecting personally identifiable information in its accident reports (specifically date of birth) and not wanting to place additional requirements on its investigators without purpose. Although DHS disagrees that collecting date of birth information would have any significant investigative benefit unless age is relevant to the cause of the accident, the purpose served by our recommendation is not limited to investigating vessel accidents. Our recommendation supports a broader marine safety purpose of strengthening the service's ability to assess the sufficiency of its survival craft regulations and improving the survivability of children and the elderly. Because collecting date of birth information is clearly relevant to that purpose, it would not be improper under DHS's Privacy Policy.

Moreover, as we state in the report, the Coast Guard already collects date of birth information in vessel accident reports, but it does so inconsistently. For example, Coast Guard data showed it had done so for about 40 percent of people involved in vessel accidents during fiscal years 2010 through 2019. Ensuring such information is collected consistently will provide greater assurance the Service has the information it needs to accurately assess the efficacy of survival craft requirements.

In its 2017 *Non-Immersion Survival Craft* report to Congress, the Coast Guard reported that data limitations had affected its ability to make projections about the risks associated with the use of survival craft. Among other things, the Coast Guard reported that it had insufficient information from the casualty reports to make a projection of the number of casualties involving persons with disabilities. It also noted that without quantitative estimates of risk and risk reduction, it was not possible to calculate the cost effectiveness of requiring the carriage of survival craft to address the risks to people with disabilities, children, and the elderly. Having the additional information we recommend the Coast Guard collect would clearly help it address a data limitation it identified and better assess the survivability of these people under existing survival craft regulations.

In summary, the Coast Guard's quality management system framework states that the service should ensure continual improvement to meet its marine safety mission to reduce casualties. The Coast Guard achieves this mission, in part, by using a risk-based approach to survival craft requirements using factors such as survivability and casualty analysis. Its 2017 *Non-Immersion Survival Craft* report to Congress and our own analysis highlight opportunities for the Coast Guard's continued improvement to meet its marine safety mission. Requiring its investigators to collect age, known disability, and usage of lifesaving equipment information in all cases, not just some cases, could help the service assess this risk.

DHS concurred with our second recommendation that the Coast Guard fully implement OMB and GAO cost and benefit estimate best practices in developing future estimates of the implementation costs for out-of-water survival craft requirements, including relying on the most current inflation information and discounting future costs and benefits for cost effectiveness projections, and documenting its methods for calculating acquisition costs. DHS stated that the Coast Guard Office of Standards Evaluation and Development will ensure that all future out-of-water survival craft economic analyses utilize real discount rates of 3 and 7 percent—per OMB Circular A-4, Regulatory Analysis, dated September 17, 2003, as well as the Coast Guard's current practice for all economic analyses, including regulatory impact analyses, and corresponding GAO cost and benefits best practices. It stated that the office will also utilize best practices for the DHS Chief Regulatory Economist's Value of Statistical Life, dated March 1, 2021, for future out-of-water survival craft economic analyses, and will update the Coast Guard's survival craft cost analysis every 5 years, pursuant to the Coast Guard Authorization Act of 2016. It estimated completing these actions by December 31, 2021.

DHS concurred with our third recommendation that the Coast Guard analyze its cold water determinations using the best available long-term water temperature data and, if appropriate, update its cold water areas determination guidance for certain lifesaving equipment requirements on commercial vessels. It stated that the Coast Guard Office of Commercial Vessel Compliance will review the water temperatures and determine whether updates to the May 20, 1991, NVIC 7-91, "Determination of Cold Water Areas," are needed. It estimated completing these actions by December 31, 2021.

DHS concurred with our fourth recommendation that the Coast Guard establish a process to routinely review and update, if appropriate, its cold

water areas determination guidance for certain lifesaving equipment requirements on commercial vessels using the best available temperature data. DHS stated that the Office of Commercial Vessel Compliance will establish a process to review the NVIC 7-91 every 5 years, and update the information as appropriate, using its Mission Management System process. It estimated completing these actions by December 31, 2021.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Homeland Security, and other interested parties. In addition, the report is available at no charge on the GAO website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (206) 287-4804 or AndersonN@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix V.

Nathan J. Anderson
Director, Homeland Security and Justice

Appendix I: OMB and GAO Cost and Benefit Estimate Best Practices

We used the following Office of Management and Budget and corresponding GAO best practices to assess the extent to which the Coast Guard estimated the costs and benefits of implementing out of water survival craft requirements. Figure 9 provides a cross walk between the two sets of best practices where the content is similar. For example, OMB's best practice for describing the need for the regulatory action states that an analysis should begin with a reasonably detailed description of the need for the regulatory action and should include an explanation of how the regulatory action will meet that need. This is similar to GAO's best practice for explaining the objective and scope of an economic analysis, which recommends an explanation of the action examined and includes a rationale and justification for the action.

Figure 9: Office of Management and Budget (OMB) and GAO Cost and Benefit Estimate Best Practices

The Office of Management and Budget (OMB) and the GAO Cost and Benefit Estimate Best Practices

OMB Circular A-4, Steps of a Regulatory Impact Analysis[a]	*GAO Assessment Methodology for Economic Analysis*, key methodological elements[b]
Describe the need for the regulatory action An analysis should begin with a reasonably detailed description of the need for the regulatory action and should include an explanation of how the regulatory action will meet that need. If a regulation is required by statute or judicial directive, the regulatory impact analysis should clearly explain the specific authority, extent of agency discretion, and permissible regulatory instruments.	**Objective and Scope—the objective and scope of the analysis** The economic analysis explains the action examined and includes a rationale and justification for the action. The analysis states its objective. The scope of the analysis is designed to address this objective.
Define the baseline The baseline represents the agency's best assessment of what the world would be like absent the action. For analyses supporting modifications to an existing regulation, a baseline assuming no change in the regulatory program generally provides an appropriate basis for evaluating regulatory alternatives.	**Methodology—the methodology used to examine the economic effects** The economic analysis examines the effects of the action by comparing alternatives, using one of them as the baseline. Unless otherwise justified, it considers alternatives that represent all relevant alternatives, including that of no action. The analysis defines an appropriate baseline.
Set the time horizon of analysis Agencies should consider how long the regulation being analyzed is likely to have economic effects when choosing the appropriate time horizon for estimating benefits and costs. The time frame for the analysis should cover a period long enough to encompass all the important benefits and costs likely to result from the rule.	**Objective and Scope—the objective and scope of the analysis** Unless otherwise justified, the analysis focuses on economic effects that accrue to citizens and residents of the United States, and its time horizon is long enough to encompass the important economic effects of the action.
Identify a range of regulatory alternatives The agency should consider a range of potentially effective and reasonably feasible regulatory alternatives. The relevant alternatives might involve different approaches, with distinct advantages and disadvantages. In considering which alternatives to discuss, an agency should reasonably explore which approaches are feasible and plausible ways of meeting the regulatory objective. An agency should give particular attention to identifying and assessing flexible regulatory approaches, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public.	**Methodology—the methodology used to examine the economic effects** The analysis justifies that the world specified under each alternative considered (including the baseline) represents the best assessment of what the world would be like under that alternative. The analysis identifies the important economic effects for each alternative considered, their timing, and whether they are direct or ancillary effects.

Source: GAO analysis of OMB and GAO documentation. | GAO-21-247

The Office of Management and Budget (OMB) and the GAO Cost and Benefit Estimate Best Practices

OMB Circular A-4, Steps of a Regulatory Impact Analysis[a]	*GAO Assessment Methodology for Economic Analysis*, key methodological elements[b]
Identify the consequences of regulatory alternatives Agencies should identify the potential benefits and costs for each alternative and its timing. It may be useful to identify the benefits and costs that can be monetized, and their timing; benefits and costs that can be quantified, but not monetized, and their timing; benefits and costs that that cannot be quantified.	**Methodology—the methodology used to examine the economic effects.** See above
Quantify and monetize the benefits and costs The agency should use the best reasonably obtainable scientific, technical, economic, and other information to quantify the likely benefits and costs of each regulatory alternative. Presenting benefits and costs in physical units in addition to monetary units will improve the transparency of the analysis.	**Analysis of Effects—the analysis of economic effects** Where feasible, the economic analysis quantifies the important economic effects and monetizes them using the concept of opportunity cost. Where the equity and distributional impacts are important, the full range of these impacts is separately detailed and quantified, where feasible.
Evaluate non-quantified and non-monetized benefits and costs Sound quantitative estimates of benefits and costs, where feasible, are preferable to qualitative descriptions of benefits and costs because they help decision-makers to understand the magnitudes of the effects of alternative actions and compare across different types of consequences.	**Analysis of Effects—the analysis of economic effects** Where important economic effects cannot be quantified, the analysis explains how they affect the comparison of alternatives.
Discount future benefits and costs The benefits and costs of a regulatory action typically take place in the future. Moreover, benefits and costs may not be distributed across time in the same manner. For example, a common challenge in evaluating alternatives that have health-related consequences is to quantify the time lag between when an action would take effect and when the resulting change in health status will be observed. To provide an accurate assessment of benefits and costs that occur at different points in time or over different time horizons, an agency should use discounting. Agencies should provide benefit and cost estimates using both 3 percent and 7 percent annual discount rates expressed as a present value as well as annualized. These are “real” interest rates that should be used to discount benefits and costs measured in constant dollars. Unlike typical market interest rates, real rates exclude the expected rate of future price inflation.	**Analysis of Effects—the analysis of economic effects** The analysis applies the criterion of net present value, or related outcome measures, to compare these effects across alternatives. It controls for inflation and uses economically justified discount rates.

Source: GAO analysis of OMB and GAO documentation. | GAO-21-247

The Office of Management and Budget (OMB) and the GAO Cost and Benefit Estimate Best Practices

OMB Circular A-4, Steps of a Regulatory Impact Analysis[a]	*GAO Assessment Methodology for Economic Analysis*, key methodological elements[b]
Characterize uncertainty in benefits, costs, and net benefits Regulatory analysis requires forecasts about the future. The goal of the agency's uncertainty analysis is to present both a central "best estimate," which reflects the expected value of the benefits and costs of the rule, as well as a description of the ranges of plausible values for benefits, costs, and net benefits, which informs decision-makers and the public of the degree of uncertainty associated with the regulatory decision.	**Transparency—the transparency of the analysis of economic effects** The economic analysis describes and justifies the analytical choices, assumptions, and data used. The analysis assesses how plausible adjustments to each important analytical choice and assumption affect the estimates of the economic effects and the results of the comparison of alternatives. The analysis explains the implications of the key limitations in the data used. Where feasible, the analysis adequately quantifies how the statistical variability of the key data elements underlying the estimates of the economic analysis impacts these estimates, and the results of the comparison of alternatives.
OMB general consideration The agency should clearly document all of the assumptions and methods used in the analysis, discuss the uncertainties associates with estimates, and publicly provide the supporting data and underlying analysis (if possible on the Internet, so that a qualified third party reading the analysis could understand and reproduce the analysis.	
	Documentation—the documentation included in the analysis The economic analysis is clearly written, with a plain language summary, clearly labeled tables that describe the data used and results, and a conclusion that is consistent with these results. The analysis cites all sources used and documents that it is based on the best available economic information.

Source: GAO analysis of OMB and GAO documentation. | GAO-21-247

[a]OMB, *Circular A-4: Regulatory Analysis* (Washington, D.C.: 2003). Circular A-4 identifies nine steps of a Regulatory Impact Analysis.

[b]GAO, *Assessment Methodology for Economic Analysis*, GAO-18-151SP (Washington, D.C.: April 2018). The GAO-18-151SP Assessment Methodology for Economic Analysis identifies five key elements.

Appendix II: Number of Vessel Accidents, Survivors, and Casualties due to Water Immersion by Vessel Type

Based on our analysis of data from the Coast Guard's Marine Information for Safety and Law Enforcement system, we determined the types of vessels, number of survivors, and number of casualties from vessel accidents from fiscal years 2010 through 2019. Table 2 shows the number of vessel accidents, survivors, and casualties by vessel type.

Table 2: Number of Vessel Accidents, Survivors, and Casualties Involving Water Immersion by Vessel Type, Fiscal Years 2010 through 2019.

Vessel Type	Vessel Accidents		People Involved in Accidents		Survivors		Casualties	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Cargo Vessels	9	1	144	3	108	3	36	10
Commercial Fishing Vessels	523	51	1,511	36	1,396	36	115	33
Oceanographic Research Vessels	2	0	14	0	13	0	1	0
Offshore Supply Vessels	20	2	101	2	91	2	10	3
Other Vessels[a]	162	16	665	16	588	15	77	22
Small Passenger Vessels	110	11	1,141	27	1,075	28	66	19
Towing Vessels	146	14	424	10	400	10	24	7
Uninspected, but Regulated, Vessels[b]	1	0	1	0	1	0	0	0
Unknown Vessels[c]	57	6	198	5	175	5	23	7
Total	**1,030**	**100**	**4,199**	**100**	**3,847**	**100**	**352**	**100**

Source: GAO analysis of Coast Guard data. | GAO-21-247

Note: Some percentages do not equal 100 percent because of rounding.

[a]Other vessels include vessels that are not inspected and are not required to carry survival craft by the Coast Guard , such as a recreational vessel.

[b]An uninspected but regulated vessel is a vessel subject to survival craft regulations issued by the Coast Guard, but is not inspected for compliance.

[c]Unknown vessels are those that Coast Guard data did not have enough information for GAO to classify.

Appendix III: Extent the Coast Guard Met OMB and GAO Best Practices in Estimating Costs and Benefits to Inform Policy Choices

Table 3 provides details on how the Coast Guard's 2013 *Survival Craft Safety* and 2017 Non-Immersion Survival Craft reports to Congress estimating the costs and benefits of requiring vessel that carry in-water survival craft to install out-of-water survival craft met eight of 10 Office of Management and Budget (OMB) best practices and the corresponding GAO best practices. However, we found that these reports did not meet two of 10 OMB best practices and corresponding GAO best practices. Specifically, the Coast Guard's 2013 *Survival Craft Safety* and 2017 *Non-Immersion Survival Craft* reports to Congress did not discount future benefits and costs or document assumptions.

Table 3: Extent the Coast Guard Met Office of Management and Budget (OMB) and GAO Best Practices In Estimating Costs and Benefits to Inform Policy Choices

OMB and GAO Cost and Benefit Estimate Best Practices[a]			Description of the Extent Coast Guard's Estimates Met OMB and GAO Best Practices[d]		
	OMB Circular A-4, Steps of a Regulatory Impact Analysis[b]	GAO Assessment Methodology for Economic Analysis, key methodological elements[c]	2013 Survival Craft Safety	2017 Non-Immersion Survival Craft	
1.	Describe the need for the regulatory action	Objective and scope	●	●	Coast Guard provided this information in its 2013 *Survival Craft Safety* and 2017 *Non-Immersion Survival Craft* reports to Congress by citing reporting requirements in the Coast Guard and Maritime Transportation Act of 2012 and the Coast Guard Authorization Act of 2016, which required a cost-benefit analysis. Specifically, to inform future policy choices, these statutes required Coast Guard to report on the effect an out-of-water survival craft requirement would have on vessel safety, survivability, and costs for vessel operators that carry in-water survival craft.
2.	Define the baseline	Methodology	●	●	Coast Guard provided this information by describing regulations current at that time. For example, in the 2013 *Survival Craft Safety report* to Congress, the Coast Guard stated that current regulations allow carriage of in-water survival craft for various vessel types such as certain small passenger vessels and commercial fishing vessels, among others.
3.	Set the time horizon of analysis	Objective and scope	●	●	Coast Guard provided this information by including a 10-year projection of the cost effectiveness of requiring out-of-water survival craft in its 2013 *Survival Craft Safety* report. The 2017 *Non-Immersion Survival Craft* report did not update this analysis but the 2017 report falls within the 10-year projection and we did not find it necessary to add another version in the 2017 report.

OMB and GAO Cost and Benefit Estimate Best Practices[a]			Description of the Extent Coast Guard's Estimates Met OMB and GAO Best Practices[d]		
	OMB Circular A-4, Steps of a Regulatory Impact Analysis[b]	GAO Assessment Methodology for Economic Analysis, key methodological elements[c]	2013 Survival Craft Safety	2017 Non-Immersion Survival Craft	
4.	Identify a range of regulatory alternatives	Methodology	●	●	Although Coast Guard did not provide a range of regulatory alternatives in its congressional reports, this was not a required reporting element for either report. However, in its 2013 *Survival Craft Safety* report, Coast Guard indicated that it had extensively considered alternative requirements for small passenger vessels, but determined that current regulations for survival craft appropriately balanced the number of persons at risk, the threat due to hypothermia, and cost, consistent with requirements for a regulatory analysis of costs and benefits.
5.	Identify the consequences of regulatory alternatives	Methodology	●	●	Since a range of regulatory alternatives was not required (see above) identifying their consequences was not necessary.
6.	Quantify and monetize the benefits and costs	Analysis of effects	●	●	The Coast Guard projected the first-year acquisition costs, as well as the costs and benefits across a 10-year period in its 2013 *Survival Craft Safety* report. In its 2017 *Non-Immersion Survival Craft* report to Congress, the Coast Guard also provided first-year acquisition costs per vessel in its estimates of costs and benefits of implementing out of water survival crafts. See discussion in report body.
7.	Evaluate non-quantified and non-monetized benefits and costs	Analysis of effects	●	●	The Coast Guard discussed certain economic effects that could not be quantified. For instance, Coast Guard's 2013 *Survival Craft Safety* report indicated that installation costs associated with the survival craft itself that were not monetized will vary by vessel (and may be substantial); and the 2017 *Non-Immersion Survival Craft* report included a discussion that stability tests may affect the weight of the survival craft and revenues.
8.	Discount future benefits and costs	Analysis of effects	○	○	Coast Guard did not control for inflation and did not use economically justifiable discount rates. See discussion in report body.
9.	Characterize uncertainty in benefits, costs, and net benefits	Transparency	●	●	We determined that the information the Coast Guard used did not warrant characterizing uncertainty in benefits and costs. As such, we consider that the Coast Guard met this best practice because it properly dealt with the element.
10.	OMB General consideration—document assumptions	Transparency	○	○	Coast Guard did not fully document calculation methods. See discussion in report body.

OMB and GAO Cost and Benefit Estimate Best Practices[a]		Description of the Extent Coast Guard's Estimates Met OMB and GAO Best Practices[d]		
OMB Circular A-4, Steps of a Regulatory Impact Analysis[b]	**GAO Assessment Methodology for Economic Analysis, key methodological elements[c]**	**2013 Survival Craft Safety**	**2017 Non-Immersion Survival Craft**	
	Documentation clearly labels	●	●	Coast Guard provided this by clearly labeling tables that described the data used and results in both its 2013 *Survival Craft Safety* and 2017 *Non-Immersion Survival Craft* reports.

Legend: ● = met, ○ = not met.

Sources: GAO analysis of Coast Guard documentation. | GAO-21-247

[a]Appendix I provides a crosswalk of the GAO and OMB best practices.

[b]OMB, Circular A-4: Regulatory Analysis (Washington, D.C.: 2003).

[c]GAO, Assessment Methodology for Economic Analysis, GAO-18-151SP (Washington, D.C.: April 2018).

[d]According to GAO's assessment methodology for best practices, Coast Guard's estimates "met" a best practice if the estimate considered and properly dealt with the element. Additionally, Coast Guard's estimates "did not meet" a best practice if these estimates did not consider or properly address the element. See GAO-18-151SP.

Appendix IV: Comments from the Department of Homeland Security

U.S. Department of Homeland Security
Washington, DC 20528

Homeland Security

March 5, 2021

Mr. Nathan J. Anderson
Director, Homeland Security and Justice
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Re: Management Response to Draft Report GAO-21-247, "COAST GUARD: More Information Needed to Assess Efficacy and Costs of Vessel Survival Craft Requirements"

Dear Mr. Anderson:

Thank you for the opportunity to comment on this draft report. The U.S. Department of Homeland Security (DHS or the Department) appreciates the U.S. Government Accountability Office's (GAO) work in planning and conducting its review and issuing this report.

The Department is pleased to note GAO's recognition that the Coast Guard's 2013 Survival Craft Safety and 2017 Non-Immersion Survival Craft reports to Congress met eight of ten best practices for estimating out-of-water survival craft requirements. In addition, GAO found that nearly 83 percent of vessel accident cases resulted in no casualties during fiscal years 2010 through 2019, which illustrates Coast Guard efforts to ensure vessel safety. The Coast Guard remains committed to evaluating future vessel accidents and revising its lifesaving equipment guidance, as appropriate, based on updated data to ensure the continued safety of the commercial vessel fleet

The draft report contained four recommendations, one with which the Department non-concurs (Recommendation one) and three with which the Department concurs (Recommendations two through four). Attached, find our detailed response to each recommendation. DHS previously submitted technical comments addressing several accuracy, contextual, and other issues under a separate cover for GAO's consideration.

Again, thank you for the opportunity to review and comment on this draft report. Please feel free to contact me if you have any questions. We look forward to working with you again in the future.

Sincerely,

JIM H CRUMPACKER

Digitally signed by JIM H CRUMPACKER
Date: 2021.03.05 07:48:36 -05'00'

JIM H. CRUMPACKER, CIA, CFE
Director
Departmental GAO-OIG Liaison Office

Attachment

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Attachment: Management Response to Recommendations Contained in GAO-21-247

GAO recommended that the Commandant of the Coast Guard ensure that the Director of Inspections and Compliance [CG-5PC]:

Recommendation 1: Revise its vessel accident investigations guidance to require Coast Guard investigators to collect date of birth, known disability, and use of lifesaving equipment of people in vessel accidents who were casualties due to water immersion or used lifesaving equipment.

Response: Non-concur. Coast Guard Marine Casualty Investigating Officers (IOs) are not required by statute or regulation to collect date of birth, known disability, and use of lifesaving equipment of people in vessel accidents who were casualties due to water immersion or used lifesaving equipment. However, IOs already collect this type of information on a case-by-case basis when the information is needed for a specific investigative purpose, such as when the IO determines that an involved subject's disability was a contributing factor to a marine casualty.

Further, birth dates associated with documenting a person's age are protected by Personally Identifiable Information (PII) requirements. Specifically, per DHS Directive 047-01, Privacy Policy and Compliance, dated July 7, 2011, the Department should only collect PII that is directly relevant and necessary to accomplish the specified purpose. Mandating collection of this type of information in all cases subject to this recommendation (even those where the information is not relevant to a contributing factor of an investigation) would be improper and, even if construed as proper, it would be overly burdensome and impractical, and would not add any significant benefit(s) to the investigative process.

Therefore, DHS requests that GAO consider this recommendation resolved and closed.

Recommendation 2: Fully implement OMB [Office of Management and Budget] and GAO cost and benefit estimate best practices in developing future estimates of the implementation costs for out-of-water survival craft requirements, including relying on the most current inflation information and discounting future costs and benefits for cost effectiveness projections, and documenting its methods for calculating acquisition costs.

Response: Concur. The Coast Guard Office of Standards Evaluation and Development (CG-REG) will ensure that all future out-of-water survival craft economic analyses utilize real discount rates of 3 and 7 percent, per OMB Circular A-4, Regulatory Analysis, dated September 17, 2003, as well as the Coast Guard's current practice for all economic analyses, including regulatory impact analyses, and corresponding GAO cost

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and benefits best practices. CG-REG will also utilize best practices for the DHS Chief Regulatory Economist's Value of Statistical Life, dated March 1, 2021, for future out-of-water survival craft economic analyses, and will update the Coast Guard's survival craft cost analysis every five years, pursuant to the Coast Guard Authorization Act of 2016. Estimated Completion Date (ECD): December 31, 2021.

Recommendation 3: Analyze its cold water determinations using best available long-term water temperature data and, if appropriate, update its cold water determination guidance for certain lifesaving equipment requirements on commercial vessels.

Response: Concur. The Coast Guard Office of Commercial Vessel Compliance (CG-CVC) will review the water temperatures and determine whether updates to the May 20, 1991, Navigation and Vessel Inspection Circular (NVIC) 7-91, "Determination of Cold Water Areas," are needed. ECD: December 31, 2021.

Recommendation 4: Establish a process to routinely review and update, if appropriate, its cold water areas determination guidance for certain lifesaving equipment requirements on commercial vessels using the best available temperature data.

Response: Concur. CG-CVC will establish a process to review the NVIC 7-91 every five years, and update the information as appropriate, using CG-CVC's Mission Management System process. CG-CVC anticipates completing the first review by the end of calendar year 2021. ECD: December 31, 2021.

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Appendix V: GAO Contact and Staff Acknowledgments

GAO Contact

Nathan Anderson, (206) 287-4804, AndersonN@gao.gov

Staff Acknowledgments

In addition to the contact above, Jason Berman (Assistant Director), Benjamin Crossley, Dominick Dale, Christine Davis, Wendy Dye (Analyst-in-Charge), Aaron Gluck, Robert Gudea, John Karikari, Tracey King, Grant Mallie, Amanda Miller, John Mingus, and Edward (Jim) Rice made key contributions to this report.

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