

NATIONAL TRANSPORTATION SAFETY BOARD

Safety Research Division

Washington, DC 20594

July 17, 2020

DATA REPORT: Incidents Involving Small Passenger Vessels (2002-2019)

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1. DATA REQUEST

1.1. Objective

- This data report provides a descriptive summary of small passenger vessel fleet size and characteristics. It also examines the frequency of marine incidents involving these vessels investigated by the US Coast Guard. This information may provide background information in support of the [investigation of the diving vessel Conception](#), near Santa Cruz Island, California, on September 2, 2019.
- The NTSB prepared an internal report titled “Staff Assessment of Safety Board Efforts in Small Passenger Vessel Safety” in 2007. The report provided a descriptive summary of US Coast Guard data from the Marine Information for Safety and Law Enforcement (MISLE) database for the period 2000-2006. This data report follows a similar methodology using MISLE data for the period 2002-2019.
- The objective of this data report is to summarize MISLE data related to small passenger vessel incidents, initiating events, and resulting casualties from 2002-2019.

2. DATA SOURCE AND LIMITATIONS

2.1. United States Coast Guard (USCG) Marine Information for Safety and Law Enforcement (MISLE) database

- The MISLE database contains data related to marine accident investigations reportable under 46 CFR 4.03 and pollution investigations reportable under 33 CFR 153.203.
- For this report, data were extracted by USCG staff and provided to NTSB via secured ftp portal on March 3, 2020. A total of 36 MS Excel files (including two summary files) were provided to NTSB. They are generally categorized as follows:
 - Incident Investigations
 - Casualties
 - Vessel Population
 - Vessel Events
- Staff requested a MISLE data dictionary or database user manual from USCG but was unsuccessful in obtaining such documents. As a result, staff cannot provide certain types of analysis in this data report.
- In many cases, MISLE vessel event and personnel casualty data on small passenger vessels were incomplete and inconsistently recorded, making it impossible to compare small passenger vessel types

by frequency of incidents or casualties over the period of interest (2002-2019). In addition, Coast Guard was not able to provide a population of vessel types by year, which precluded any calculation of accident or fatal accident rates. Further, the event types in many cases did not provide sufficient detail, and initiating events were sometimes incorrectly documented. Finally, missing, or incomplete data made it impossible to reconcile the vessel event and personnel casualty data. Such limitations will be discussed in more detail in the observation and summary section of this report.

3. DATA ELEMENTS USED AND METHODOLOGY

3.1. Definition of Small Passenger Vessel

- Title [46 CFR Subchapters T](#) and [K](#) are considered small passenger vessel. They are defined as follows:
 - T-boats: small passenger vessels that carry 150 passengers or less, or that have overnight accommodations for less than 50 passengers
 - K-boats: the largest of the small passenger vessels, which carry more than 150 passengers, or more than 49 passengers overnight
- The field [**Inspection Subchapter Type**] can be used to categorize each vessel.¹ Only those records linked to a vessel categorized as either T or K boats were retained for data analysis in this report.

3.2. Unit of Analysis

- Table 1 describes data included in the four categories of data files provided by USCG. Two fields [**Case ID**] and [**Activity ID**] provide unique sequential numerical identification. Per discussion with USCG staff, the former can be used to identify a unique marine incident.

Data File	Period	Unit of Analysis	Used in this Report for
MISLE Vessel Population Passenger	2020	Individual vessel (snapshot)	Fleet description
Personnel Casualties	2002-2020	Individual person	Fatality and injury
Incident investigations	2002-2020	Individual investigation	Initial Event
Vessel Events	2002-2020	Individual vessel (by accident)	Identification of small passenger vessels and incidents involving them

Table 1: Description of the four groups of data files provided by USCG staff for this report

4. OBSERVATIONS AND SUMMARY

4.1. Description of the fleet (as of March 2020)

- USCG staff provided two data files. They were both titled “MISLE Vessel Population Passenger,” one attributed as “Uninspected” and the other “Inspected.” The former contained 11,397 vessels, and the latter contained 21,682 vessels. A total of 33,079 vessels were included in the combined data file.
- Staff used the field [**Vessel Status**] to extract only those vessels considered “Active.”
- Staff used the field [**Inspection Subchapter Type**] to extract only those meeting the definitions above (i.e., either K or T-boats).
- A total of 10,031 active small passenger vessels were found in the data.
 - 9,890 vessels were “Inspected” while 141 were “Uninspected” (about 1% of all active small passenger vessels)
 - For the remainder of this report, staff made no distinction between “inspected” and “uninspected” vessels
- Of all 10,031 active small passenger vessels, 9,554 were T-boats (95%) and 477 were K-boats (5%).

¹ In this report, staff used [**FIELD NAME**] to identify a data field (also known as variable) in the data files provided by USCG staff.

- 8,854 of the 10,031 active small passenger vessels had a reported maximum passenger capacity [**Max Passengers Allowed**] (88% data availability). Overall, the 8,854 vessels represented a total capacity of 546,450 passengers.
- In the NTSB’s 2007 report on small passenger vessels, there was an emphasis on the distinction of vessel lengths over 65 feet. The report stated, “*power-driven fire pumps are required on all K-boats but are only on those T-boats that are over 65 feet in length or that carry more than 49 passengers.*”
 - The length classification (i.e. <=65 ft. versus >65 ft.) of each active small passenger vessel was based on the following fields:
 - [**Registered Length (ft.)**] (43% of vessels include this information); where all three variables were available, registered length was used)
 - [**Simplified Length (ft.)**] (42% of vessels include this information)
 - [**ITC Length (ft.)**] (7% of vessels include this information)²
 - The combination of the above three fields provide length information for 8,854 small passenger vessels (88%). Therefore, 1,177 small passenger vessels do not have length information (12%).
 - Staff used [**Max Passenger Allowed**] to classify each active small passenger vessel into two categories: <=49 and >49 passengers.
- Because “*power-driven fire pumps are required on all K-boats,*” Table 2 shows the active small passenger vessel counts by reported length and passenger capacity of the 9,554 T-boats. Most T-boats are under 65 feet long (75%) or carry no more than 49 passengers (68%). 5,682 T-boats are under 65 feet long and carry no more than 49 passengers, representing 59% of all T-boats or 57% of all small passenger vessels (i.e. both T and K-boats combined).

Length (Ft)	Passenger Capacity (% of Grand Total of 9,554 T-boats)			Total
	<=49	>49	Unknown	
<=65	5,682 (59%)	837 (9%)	649 (7%)	7,168 (75%)
>65	428 (4%)	1,031 (11%)	81 (1%)	1,540 (16%)
Unknown	408 (4%)	15 (0%)	423 (4%)	846 (9%)
Total	6,518 (68%)	1,883 (20%)	1,153 (12%)	9,554 (100%)

Table 2: No. of active small passenger vessels by reported length and maximum passenger capacity

- The 5,682 T-boats (<=65 feet and <=49 passengers) have a total passenger capacity of 149,606 passengers. Because they are not over 65 feet and do not carry more than 49 passengers, they are exempt from the power-driven fire pump requirement.
- Figure 1 shows the hull material of the 477 K-boats [**Hull Material**]. Most K-boats were steel (284 vessels, 60%) and aluminum (164 vessels, 34%).

² ITC is assumed to stand for International Tonnage Certificate.

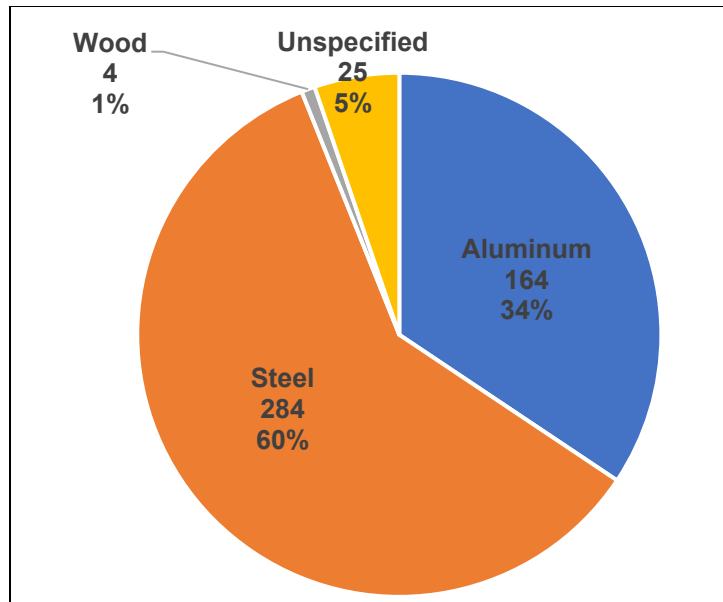


Figure 1: Hull material of the 477 K-boats

- Figure 2 shows the distribution of 9,554 T-boats by hull material. The two most often used materials are aluminum (3,129 vessels, 33%) and fiberglass (3,002 vessels, 31%). The next two materials are wood (1,503 vessels, 16%) and steel (1,245, 13%). These four materials comprise 93% of all T-boats.

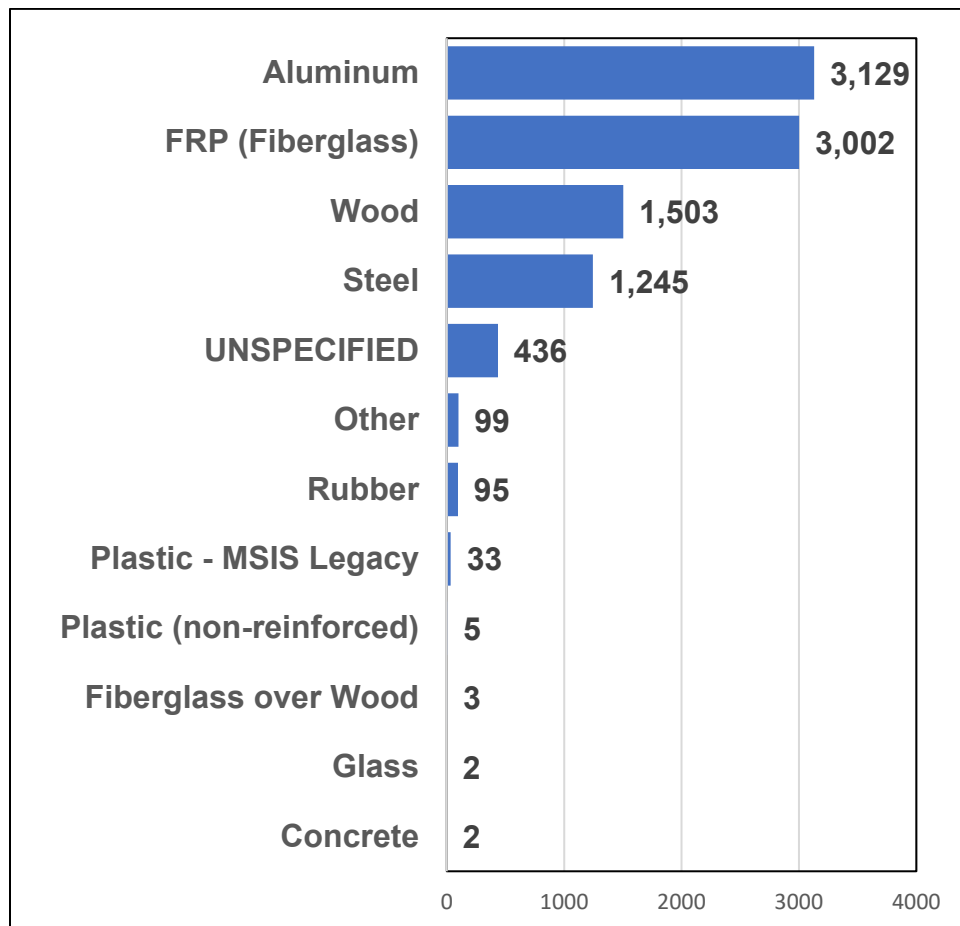


Figure 2: Hull material of the 9,554 T-boats

- Figure 3 focuses on the 5,682 T-boats that are exempt from the power-driven fire pump requirement. The same four materials (fiberglass, aluminum, wood, and steel) made up most of these T-boats (96%). The main difference between this subset of T-boats is that 43% of them use fiberglass as hull material, as compared to 31% of all T-boats.

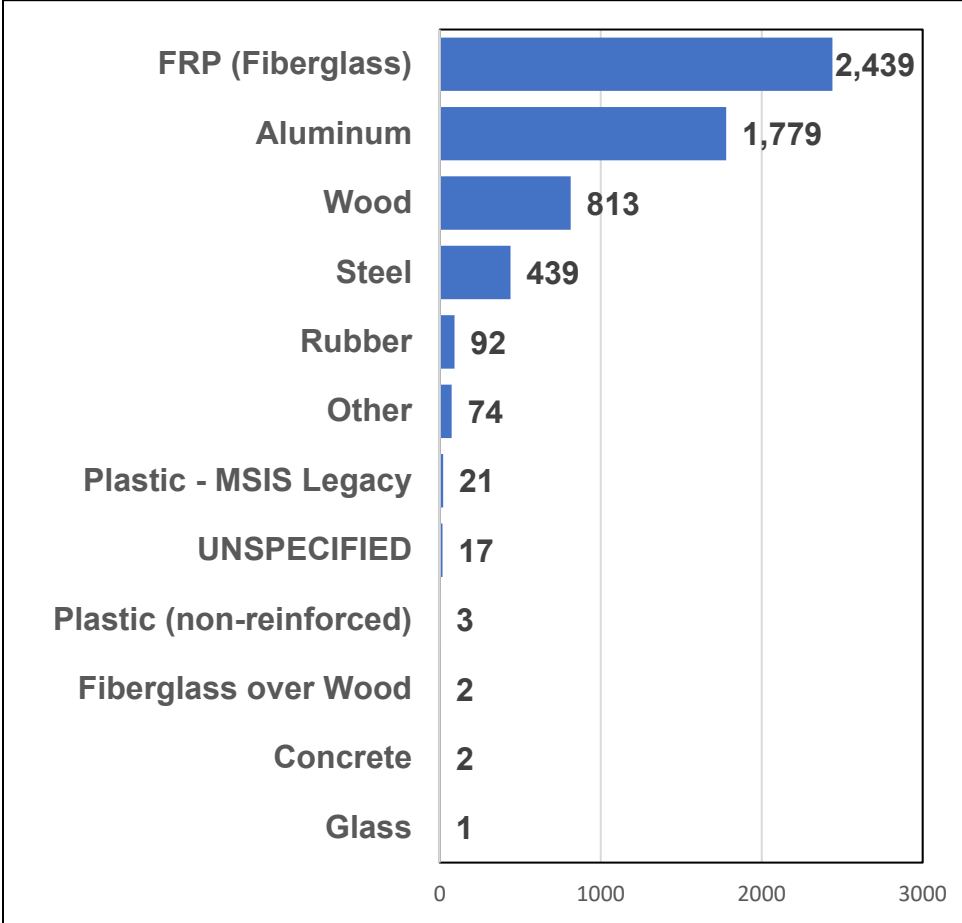


Figure 3: Hull material of 5,682 T-boats that are exempt from the power-driven fire pump requirement

- The year in which each small passenger vessel was built [**Build Year**] was available for 9,407 small passenger vessels (94%). Based on this field, the average age of K-boats was 29 years and T-boats 34 years. Overall age of all small passenger vessels was 34 years.
- Small passenger vessels are subject to stability requirements and the environment where each vessel can operate is captured in the field [**AREA ROUTE STABILITY TYPE**]. However, only 6,006 (60%) small passenger vessels had this information available. Table 3 shows the distribution of these small passenger vessels by area route stability type. Most small passenger vessels (68%) are restricted to operate in a “partially protected” or “protected” environment. The main difference between K and T-boats is that a higher percentage of T-boats is allowed in “exposed” environment (32% versus 20% for K-boats).

	K-Boats		T-Boats		All	
	Count	%	Count	%	Count	%
Exposed	80	20	1,776	32	1,856	31
Partially Protected	208	51	2,234	40	2,442	41
Protected	119	29	1,589	28	1,708	28
Total with Known Information	407	100	5,599	100	6,006	100

Table 3: No. of active K and T-boats by area route stability types

- Small passenger vessels operate throughout the United States. Each area of operation is referred to as a route [**ROUTE TYPE**] and listed here in order of complexity: “oceans,” “coastwise,” “limited coastwise,” “great lakes,” “lakes, bays, and sounds,” or “rivers.” Unless expressly prohibited on the certificate of inspection (COI), vessels can operate on routes of lesser complexity than those specified on the COI. Table 4 shows how the small passenger vessels are distributed by route types. Unlike information about area route stability, only 6% of these 10,031 vessels were attributed with “unspecified” route type. Overall, 27% of small passenger vessels can operate in “lakes, bays, and sounds” route and another 24% are allowed in this route plus “limited coastwise” route. The biggest difference between K-boats and T-boats is that 26% of K-Boats are restricted to “river” route, whereas only 17% of T-boats have such a restriction.

Route Type	K-Boats		T-Boats		All	
	Count	%	Count	%	Count	%
Oceans	9	2	1,497	16	1,506	15
Coastwise	12	3	696	7	708	7
Coastwise and Great Lakes	1	0	5	0	6	0
Great Lakes	17	4	180	2	197	2
Lakes, Bays, and Sounds plus Limited Coastwise	112	23	2,271	24	2,383	24
Lakes, Bays, and Sounds plus Limited Great Lakes	8	2	30	0	38	0
Lakes, Bays, and Sounds	149	31	2,567	27	2,716	27
Rivers plus Limited Great Lakes	21	4	79	1	100	1
Rivers	122	26	1,611	17	1,733	17
Unspecified	26	5	618	6	644	6
Total	477	100	9,554	100	10,031	100

Table 4: No. of active K and T-boats by route types

- Table 5 shows the distribution of small passenger vessels by US Coast Guard Division. Most small passenger vessels were not assigned to a specific district, 31% were “unspecified.” The three districts with the most small passenger vessels were: Gulf Coast Midwest (district 8, 13%), Southeast (district 7, 13%), and Northeast (district 1, 12%). The distribution of T-boats among these three districts are comparable: Gulf Coast (district 8, 14%), Southeast (district 7, 13%), and Northeast (district 1, 11%). However, 35% of all K-boats were assigned to Northeast (district 1).

Coast Guard District			K-Boats		T-Boats		All	
District	Code	Name	Count	%	Count	%	Count	%
1	341	Northeast	166	35	1,037	11	1,203	12
5	304	Atlantic	19	4	613	6	632	6
7	264	Southeast	44	9	1,256	13	1,300	13
8	483	Gulf Coast	37	8	1,316	14	1,353	13
9	169	Great Lake	52	11	340	4	392	4
11	145	Southwest	71	15	650	7	721	7
13	123	Northwest	29	6	395	4	424	4
14	456	Hawaii	3	1	433	5	436	4
17	100	Alaska	13	3	331	3	344	3
	625	Europe	0	0	2	0	2	0
		Unspecified	43	9	3,071	32	3,114	31
		Unknown	0	0	110	1	110	1
		Total	477	100	9,554	100	10,031	100

Table 5: No. of K and T-boats by USCG Districts

4.2. Fatalities and Injuries

- There were 3,488 individuals included in the Personnel Casualties data files associated with small passenger vessels during the period 2002 to 2019.³
- Table 6 shows person types [**Party-Subject Relationship**] and casualty types [**Casualty Type**] for the 3,488 individuals. Passengers made up 82% of all individuals included in the file, and 13% were crewmembers.
- 2,800 individuals were injured, making up 80% of all persons. There were 668 individuals identified as dead (according to casualty type), representing 19%. The remaining 20 individuals were identified as “missing,” “missing – active search,” and “exposure no injury.”

³ USCG provided a data file that contains 18,389 person-level records in MISLE Personnel Casualties CY 2002 to Present.xlsx; the data field [**Insp. Subchapter Type**] was used to identify 3,488 individuals in small passenger vessels (K and T-boats).

Person Type	Casualty Type				
	Dead	Injured	Other	Total	%
Passenger	600	2,232	14	2,846	82
Crewmember	44	391	5	440	13
Master	11	81	0	92	3
Employee	3	27	0	30	1
External Victim	5	20	0	25	1
Visitor	1	21	0	22	1
Contractor Employee	2	9	1	12	0
Operator	0	7	0	7	0
Pilot	0	4	0	4	0
Owner	1	2	0	3	0
Party	1	2	0	3	0
Person in Charge	0	2	0	2	0
Managing Owner	0	1	0	1	0
Responsible Party	0	1	0	1	0
TOTAL	668	2,800	20	3,488	100

Table 6: No. of persons by person type and casualty type

- There were 1,583 individual small passenger vessels (based on unique vessel id [**Vessel ID**]) involved in accidents captured in the personnel casualty files during the period. Some vessels were involved in more than one accident over the years. 1,100 vessels were involved in 1 accident during the 2002-2019 period, representing 69% of all small passenger vessels. There were 269 vessels that were involved in 2 accidents (17%), and 110 vessels involved in 3 accidents (7%). One vessel (*Big M Casino*, Vessel ID = 684951) was involved in 9 separate accidents.
- The field [**Accident Type**] can be used to examine injuries and deaths. Like the 2007 NTSB report, staff excluded 836 persons (out of 3,468) that were linked to the following 5 accident types:
 - Noncontact Injury – Diving (155 deaths and 242 injuries)
 - Existing Medical Condition Event (237 deaths and 83 injuries)
 - Overexertion Injury – Existing medical condition (37 deaths and 31 injuries)
 - Diseases – General (22 deaths and 9 injuries)
 - Assault, homicide, suicide, or self-inflicted injury (7 deaths and 13 injuries)
- Table 7 shows a breakdown of the most common sources of injuries and deaths, in descending order by total person counts. Among the 2,422 injured persons, the most often cited was a “contact injury – fall onto surface” (40%), followed by “contact injury - collision with fixed object” (17%). In terms of fatalities, the most often cited was “noncontact injury – asphyxiation” (46%), followed by “contact injury – fall into water” (12%).

Causes/Mechanism [Accident Type]	Dead		Injured		Total	
	Count	%	Count	%	Count	%
Contact Injury - Fall onto surface	15	7	978	40	993	38
Contact Injury - Collision with Fixed Object	7	3	417	17	424	16
Contact Injury - Struck by Moving Object	3	1	199	8	202	8
Contact Injury - Other	4	2	173	7	177	7
Unknown Injury Type	22	10	133	5	155	6
Contact Injury - Fall into water	25	12	116	5	141	5
Noncontact Injury - Asphyxiation	96	46	38	2	134	5
Contact Injury - Crushed between objects	7	3	108	4	115	4
Other Injury Type	7	3	69	3	76	3
Noncontact Injury - Other	18	9	52	2	70	3
All Other Types ⁴	6	3	139	6	145	6
Total	210	100	2,422	100	2,632	100

Table 7: Fatalities and injuries

4.3. Trends of Fatality and Injury (2002-2019)

- Figure 4 shows yearly small passenger vessel fatalities and injuries for the 18-year period.⁵ In terms of injury, an average of 156 persons were injured each year. The chart singles out 2013 as the year with the most injuries. This was skewed by one accident that involved a K-boat that injured 87 persons on 1/9/2013. In terms of fatalities, over the 18-year period, an average of 37 persons died in small passenger vessel accidents. The deadliest year was 2019. The *Conception* accident occurred in 2019, which killed 34 persons (i.e., more than half of the yearly total of 64 deaths that year). The second deadliest year was 2007 in which 46 persons died; however, in that year no single accident killed more than one person. The third deadliest year was 2018, in which 45 persons died. In 2018, 17 of the 45 died in the *Stretch Duck 07* accident near Branson, MO. This suggests that the 2019 and 2018 fatality data shown in Figure 4 are skewed by two accidents (*Conception* and *Stretch Duck 07*) with high fatality counts.

⁴ All other types include Overexertion Injury - Strain or sprain; Contact Injury - Line handling/caught in lines; Noncontact Injury – Exposure; Noncontact Injury - Burn; Unspecified; Noncontact Injury - Dangerous Atmosphere; Noncontact Injury - Accidental Poisoning; Noncontact Injury - Electric Shock.

⁵ Unlike table 7, figure 5 shows all fatalities and injuries. Note that the chart in figure 5 shows counts with the 5 excluded sources of injury and death (i.e., Noncontact Injury – Diving, Existing Medical Condition Event, Overexertion Injury – Existing medical condition, Diseases – General, and Assault, homicide, suicide, or self-inflicted injury) included in the counts.

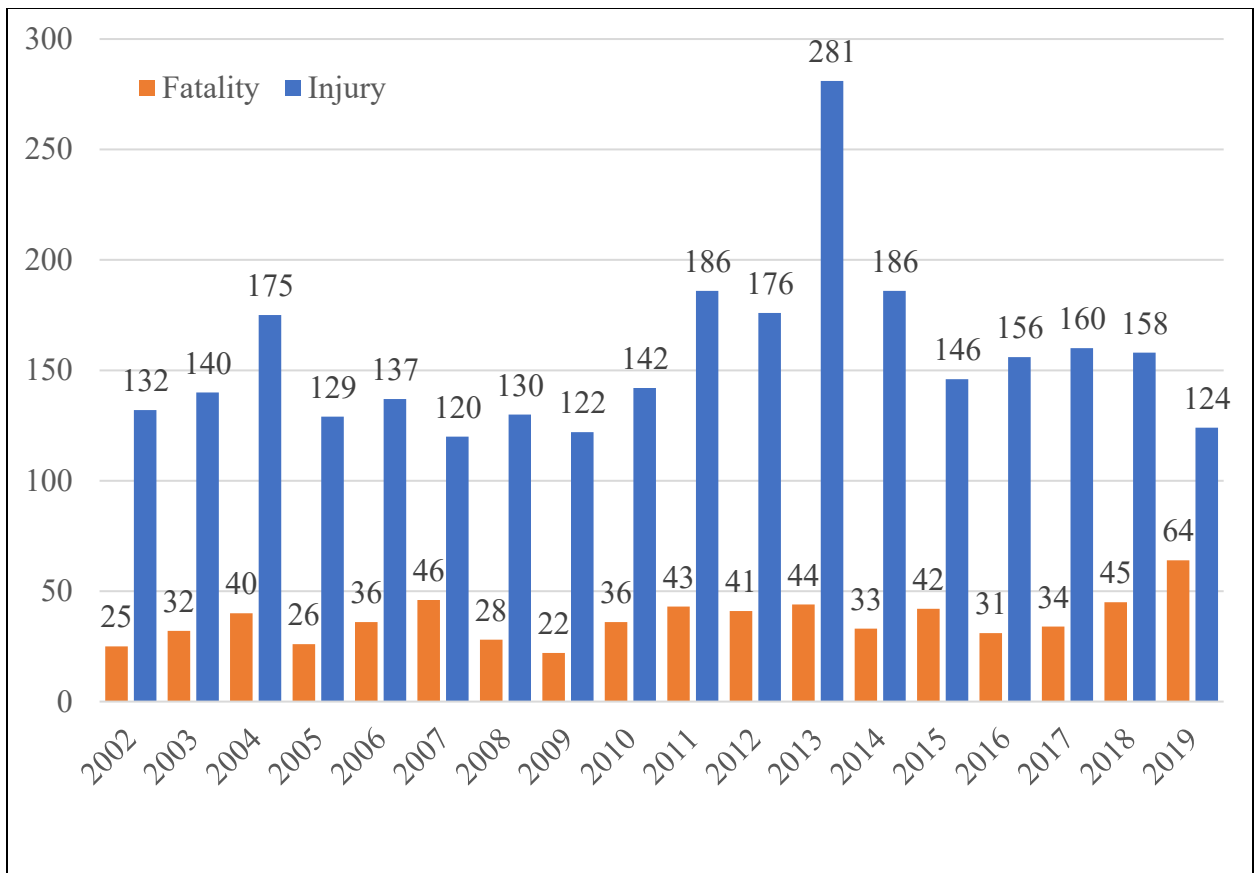


Figure 4: Yearly fatality and injury in accidents involving small passenger vessels

- Staff used unique case identification [**Case ID**] to identify unique accidents.⁶ From 2002 to 2019, there were 2,723 accidents involving at least one small passenger vessel with at least one person identified in the casualty data file. The vast majority, 2,502 accidents, involved only one small passenger vessel. 217 accidents involved two small passenger vessels, and 2 accidents involved three and four small passenger vessels, respectively.
- Of the 2,723 accidents, 2,710 of them involved at least one death or injury. There were 597 accidents that involved at least 1 death. In total, these resulted in 668 small passenger vessel deaths.
- Between 2002-2019, there were 14 small passenger vessel accidents involving multiple deaths. Table 8 lists the four accidents with more than 2 fatalities. All four accidents involved only 1 small passenger vessel. There were 65 persons that suffered fatal injuries in these 4 accidents. The 5 deaths in the *Lady D* accident were all categorized as a “contact injury – fall in water” accident type. The remaining deaths in *Conception*, *Stretch Duck 07*, and *Taki-Too* were all categorized as “noncontact injury – asphyxiation” accident type.

⁶ Based on personal communication with USCG, the field [**Case ID**] is the best field to identify unique accidents.

Vessel						
Case ID	Date	ID	Name	Type	DEAD	INJURED
1190194	9/2/2019	53173	Conception	Diving Vessel (Recreational)	34	1
1136815	7/19/2018	248292	Stretch Duck 07	Amphibious Vessel	17	0
165934	3/6/2004	439234	Lady D	Water Taxi	5	7
222966	6/14/2003	49062	Taki-Too	General	9	8

Table 8: Four accidents involving small passenger vessels with more than 2 deaths

4.4. Initial Events of Small Passenger Vessel Accidents

- Table 9 shows how the 3,468 fatalities and injuries in small passenger vessels were distributed by vessel type [Vessel/Facility Type]. There were 2,081 fatalities and injuries that occurred in small passenger vessels categorized as “general” (representing 60% of all fatalities and injuries). The next two types were “excursion/tour vessel” (345 fatalities and injuries, 10%) and “diving vessel (recreational)” (324 fatalities and injuries, 9%).

Vessel Type	Fatalities and Injuries	%
General	2,081	60
Excursion/Tour Vessel	345	10
Diving Vessel (Recreational)	324	9
Charter Fishing Vessel	135	4
Ferry	121	3
Sailing Vessel	115	3
Crew Boat	62	2
Water Taxi	61	2
Parasailing Vessel	60	2
Gaming Vessel	33	1
Harbor Cruise Vessel	33	1
Amphibious Vessel	30	1
Offshore Supply Vessel	27	1
All other types ⁷	41	1
Total	3,468	100

Table 9: Fatalities and injuries by vessel types

- NTSB’s Office of Marine Safety provided a NTSB vessel type classification system for use in this data report. It was suggested that some vessel types should be determined by reviewing the cases. The classification system included the following vessel types: Passenger, Offshore Supply, Fishing, Cargo, Recreational, and Other. However, the personnel casualty data files did not include case narratives.
- The vessel types in the USCG casualty data file that require additional examination include: General, Work Boat, Amphibious, Small Watercraft. Staff examined the vessel service classification [Vessel Service] to assign these small vessel types to the NTSB vessel type classification system as follows:

⁷ All other types include River Cruise Vessel, Ocean Cruise Vessel, Party/Head Boat (other than fish), Passenger Barge, Attraction Vessel, Fish Catching Vessel, Special Purpose Ship, Work Boat, Amphibious Vessel (DUKW, etc.), Lift Boat, Oil Recovery Vessel, and Small Watercraft. From 2002-2019, 41 fatalities and injuries occurred in these small passenger vessels.

- Amphibious Vessel – Passenger
- Sailing Vessel – Passenger
- Small Watercraft – Recreational
- Work Boat – Other (vessel service is industrial vessel)
- General – vast majority as Passenger, a few as Recreational
- Using the NTSB vessel type classification system, 3,369 fatalities and injuries occurred in small passenger vessels classified as Passenger vessels, 90 in Offshore supply vessels, 6 in Recreational vessels, and 3 in Other vessels. Therefore, 97% of the small passenger vessels in which at least one person died or suffered injury were categorized as Passenger vessels using the NTSB classification system. In addition to the fact that 97% of these vessels were classified as passenger vessels, all K and T-boats are small passenger vessels by definitions. Therefore, staff did not use the NTSB classification system in subsequent analyses.
- In the personnel casualty data files, each fatality and injury can be linked to an initial event [**Initial Event Type**]. Table 10 shows how the 3,468 fatalities and injuries were distributed among these initial events. The most frequent event types were “personnel casualty – death” for fatalities (79%) and “personnel casualty – injury” for non-fatal injuries (52%). With such high percentages of fatalities and injuries categorized under nondescript event types, staff was unable to further examine them using the USCG personnel casualty data files. As discussed earlier, the 3,468 fatalities and injuries were associated with 2,710 unique cases (accidents). Staff conducted two additional analyses to examine the events attributed to these accidents involving fatalities and injuries.
 - An incident investigation data file, provided by USCG, contained 182,426 records for the period 2002-2019. Staff linked the 2,710 fatal and injury accidents involving small passenger vessels to these investigation records using the unique case IDs. All 2,710 accidents were found and were associated with 2,965 incident investigation records (some accidents contained multiple investigation records). Staff examined the initial event types [**Initial Event Type**] identified for all 2,965 investigation records and found that the most frequently cited initial event types were: “personnel casualty – injury” (1,793 investigations, 60%), “personnel casualty – death” (542 investigations, 18%), and “material failure/malfunction” (155 investigations, 5%). These three initial event types and the corresponding percentages were like those shown in Table 10. Therefore, staff was not able to gain additional knowledge about the initial events attributed to the 2,710 fatal and injury accidents.

Initial Event Type	Fatality		Injury		Total	
	Count	%	Count	%	Count	%
Personnel Casualty - Injury	40	6	1,777	63	1,817	52
Personnel Casualty - Death	525	79	5	0	530	15
Material Failure/Malfunction	21	3	221	8	242	7
Allision	0	0	222	8	222	6
Grounding	1	0	128	5	129	4
Collision	3	0	101	4	104	3
Loss/Reduction of Vessel Propulsion/Steering	1	0	77	3	78	2
Vessel Maneuver	5	1	73	3	78	2
Personnel Fall into Water	25	4	45	2	70	2
Capsize	12	2	33	1	45	1
Loss of Stability	5	1	37	1	42	1
Wave(s) Strikes/Impacts	0	0	20	1	20	1
Flooding - Progressive	18	3	1	0	19	1
Personnel Casualty - Exposure	5	1	12	0	17	0
Vessel Yawl/Pitch/Roll/Heel	0	0	15	1	15	0
Flooding - Initial	2	0	8	0	10	0
Set Adrift	1	0	7	0	8	0
Explosion	0	0	6	0	6	0
Personnel Entering Water (not Falling)	4	1	2	0	6	0
Fouling	0	0	3	0	3	0
Discharge/Release - Pollution	0	0	2	0	2	0
Fire - Initial	0	0	2	0	2	0
Damage to Cargo	0	0	1	0	1	0
Loss of Electrical Power	0	0	1	0	1	0
Personnel Ejected from Vessel	0	0	1	0	1	0
Total	668	100	2,800	100	3,468	100

Table 10: Fatality and injury in small passenger vessels by initial event types

- Staff then examined the vessel event data files provided by USCG. Using unique case ID, staff was only able to find 431 cases (out of 2,710 cases). Therefore only 16% of accidents involving fatalities and injuries in small passenger vessels were contained in event data files. Table 11 shows the distribution of events [**Event Type**] among these 431 accidents. Because each accident can have multiple events, the total event counts add up to more than 431. The most often identified event type in fatal and injury accidents involving small passenger vessels were “material failure/malfunction” (210 events, 27%), followed by “allision” (120 events, 15%), and “loss/reduction of vessel propulsion/steering” (97 events, 12%). Therefore, at least among the 16% of fatality and injury accidents, staff were able to gain additional knowledge of the event types involved in these accidents. However, for most of these accidents (2,279 accidents, 84%), what event types that led to a death or an injury in a small passenger vessel were not specifically identified from the data files.

Event Type	Events	%
Material Failure/Malfunction	210	27
Allision	120	15
Loss/Reduction of Vessel Propulsion/Steering	97	12
Grounding	73	9
Collision	54	7
Vessel Maneuver	54	7
Flooding - Initial	29	4
Loss of Stability	20	3
Wave(s) Strikes/Impacts	18	2
Capsize	16	2
Vessel Yawl/Pitch/Roll/Heel	14	2
Discharge/Release - Pollution	13	2
Sinking	12	2
Fire - Initial	10	1
Set Adrift	8	1
Flooding - Progressive	7	1
Fouling	6	1
Abandonment	5	1
Explosion	5	1
Loss of Electrical Power	4	1
Damage to Cargo	2	0
Personnel Casualty - Injury	1	0
Total	778	100

Table 11: Event counts linked to 431 fatal or injury small passenger vessel accidents

- Using the vessel event data files, staff identified 9,867 incidents (unique cases) involving at least one small passenger vessel. All investigation records that were considered a reportable marine casualty (field [**Incident Involves**] = “marine casualty, reportable”) and linked to at least one small passenger vessel were extracted for further analysis. A total of 8,567 incidents were found. Table 12 summarizes these 8,567 accidents by fatalities, injuries, missing persons, total property damage (in US dollars) and total oil spill volume (in gallons) from 2002 to 2019. Of the 8,567 incidents, 599 were identified as “serious marine incidents,” representing 6% of all incidents; 43 involved at least one fatality; 519 involved no fatality; and 292 involved at least one injury.
- Staff built a more complete set of incident investigation data for small passenger vessels by appending all investigations that involved fatal and injury accidents in small passenger vessels (from personnel casualty data file) to those captured in the incident investigation data file. This process produced a total of 10,729 incidents (or unique cases). Table 13 shows the distribution of these 10,729 incidents by the initial event types. The most frequent initial event type was “material failure/malfunction” (43%), followed by “personnel casualty – injury” (15%).

Year	No. of Incidents	Fatalities	Injuries	US\$	Gallon (Oil)
2002	436	1	44	8,572,946	951
2003	407	11	49	4,976,211	0
2004	430	10	67	9,451,201	100
2005	463	3	42	8,226,354	1,453
2006	372	0	35	6,029,403	2,169
2007	425	2	48	9,612,548	13,265
2008	424	0	60	9,691,405	1,021
2009	438	3	52	5,367,407	3,037
2010	517	4	58	5,814,958	285
2011	623	6	45	6,672,362	1,189
2012	634	2	57	5,355,369	2,195
2013	745	5	164	10,410,462	1,748
2014	728	2	52	25,389,609	941
2015	532	4	35	7,013,953	176
2016	365	0	64	11,928,083	2,996
2017	369	1	81	5,397,945	185
2018	324	20	70	4,900,094	1,262
2019	335	36	37	3,878,109	462
Total	8,567	110	1,060	148,688,419	33,434

Table 12. Yearly incident counts, fatalities, injuries, total property damage, and oil spill volume by incidents considered to be a reportable marine casualty

Initial Event	Incidents	%
Material Failure/Malfunction	4,575	43
Personnel Casualty - Injury	1,592	15
Grounding	1,005	9
Loss/Reduction of Vessel Prop	905	8
Allision	707	7
Personnel Casualty - Death	504	5
Collision	295	3
Loss of Electrical Power	193	2
Fire - Initial	163	2
Discharge/Release - Pollution	145	1
Vessel Maneuver	137	1
Fouling	130	1
Flooding - Initial	95	1
Personnel Fall into Water	61	1
All others	222	1
Total	10,729	100

Table 13: Number of incidents by initial event types for the combined incident data file from personnel casualty data and incident investigation data files

- To examine the potential relationship between initial event types and vessel types, staff linked initial event types to each of the small passenger vessels that were either involved in fatal or injury accidents or considered reportable marine casualties. This data linkage process produced 11,025 small passenger vessels for examination. As explained earlier, many initial event types were categorized as “personnel casualty,” such as injury or death. Examination of these events would not provide additional understanding. Therefore, staff excluded these vessels from the final analysis (2,308 vessels, 21% of 11,025 vessels).⁸ Table 14 shows the distribution of small passenger vessels by initial event types and the 10 most common vessel types (by vessel counts). For 53% of all vessels, the initial event was “material failure/malfunction.” The next two most often identified events were “grounding” (12%) and “loss/reduction of vessel propulsion/steering” (11%). Staff re-examined the above table by applying a NTSB Office of Marine Safety classification system to the initial event types. Table 15 shows that 67% of all small passenger vessels in this analysis were categorized as having “hull/machinery/equipment damage” as the initial event type. The next most often identified initial event type was “contact/grounding/stranding,” comprising 22%.

⁸ In addition to personnel casualty (injury, death, exposure). Personnel falling into water, entering water (not diving), ejected from vessel, unspecified, and well blowout initial event types were also excluded. In all, 2,313 vessels were not included in the analysis.

Initial Event Type	General	Ferry	Excursion/Tour Vessel	Amphibious Vessel	Charter Fishing Vessel	Crew Boat	Sailing Vessel	Water Taxi	Offshore Supply Vessel	Diving Vessel (Recreational)	All others	Total	%
Material Failure/Malfunction	2,852	581	339	230	129	70	66	80	43	43	206	4,639	53.2
Grounding	623	79	94	13	23	31	58	14	11	14	48	1,008	11.6
Loss/Reduction of Vessel Propulsion/Steering	558	103	62	56	21	17	16	12	21	17	40	923	10.6
Allision	486	50	51	5	12	41	10	12	25	4	53	749	8.6
Collision	202	20	26	2	8	19	4	16	16	4	11	328	3.8
Loss of Electrical Power	139	20	9	5	4	3	1	0	0	3	11	195	2.2
Fire	104	10	13	1	6	10	4	2	4	0	12	166	1.9
Discharge/Release - Pollution	97	6	6	0	3	9	1	2	8	4	9	145	1.7
Vessel Maneuver	98	5	16	1	2	1	5	2	4	2	7	143	1.6
Flooding	88	7	10	4	7	4	3	1	4	1	8	137	1.6
Fouling	89	7	11	3	4	4	2	3	2	1	7	133	1.5
Set Adrift	32	0	6	0	0	2	1	0	1	2	5	49	0.6
Wave(s) Strikes/Impacts	12	5	5	0	3	0	1	0	0	0	2	28	0.3
Loss of Stability	14	0	2	0	1	0	0	1	0	0	1	19	0.2
Sinking	11	1	2	0	0	0	0	0	0	0	0	14	0.2
Vessel Yawl/Pitch/Roll/Heel	4	0	2	0	1	1	1	0	0	0	3	12	0.1
Capsize	6	0	1	0	0	0	0	0	2	1	0	10	0.1
Explosion	4	0	1	0	0	0	0	0	0	1	0	6	0.1
Cargo/Fuel Transfer/Shift	2	0	1	0	0	0	0	0	0	0	0	3	0.0
Damage to Cargo	0	1	0	0	0	0	0	0	0	0	2	3	0.0
Abandonment	1	0	0	0	0	0	0	0	0	0	1	2	0.0
Total	5,422	895	657	320	224	212	173	145	141	97	426	8,712	100.0

Table 14: No. of small passenger vessels by initial event types and ten most common vessel types

NTSB Classifications of Initial Event Types	General	Ferry	Excursion/Tour Vessel	Diving Vessel (Recreational)	Charter Fishing Vessel	Amphibious Vessel	Sailing Vessel	Crew Boat	Offshore Supply Vessel	Water Taxi	All others	Total	%
Hull/Machinery/Equipment Damage	3,593	710	421	65	157	291	85	92	65	92	266	5,837	67.0
Contact/Grounding/Stranding ⁹	1,204	136	157	20	39	21	70	76	40	29	108	1,900	21.8
Collision	202	20	26	4	8	2	4	19	16	16	11	328	3.8
Fire/Explosion	108	10	14	1	6	1	4	10	4	2	12	172	2.0
Others ¹⁰	109	7	8	4	3	0	1	9	8	2	10	161	1.8
Vessel Maneuver ¹¹	98	5	16	2	2	1	5	1	4	2	7	143	1.6
Flooding	88	7	10	1	7	4	3	4	4	1	8	137	1.6
Capsizing/Listing	20	0	5	0	2	0	1	1	0	1	4	34	0.4
Total	5,422	895	657	97	224	320	173	212	141	145	426	8,712	100.0
% of Total	62.2	10.3	7.54	1.11	2.57	3.67	1.99	2.43	1.62	1.66	4.89	100	

Table 15: Number of small passenger vessels by initial event type based on the NTSB classification’s ten most common vessel types

- In summary, it is not possible to assess risk among different types of small passenger vessels (such as diving vessels) using vessel event (such as fires), personnel casualty (fatality and injury), and other investigation data from MISLE provided by Coast Guard for this report. Coast Guard is required to record all reportable marine casualties in MISLE; however, the data on small passenger vessels provided were neither complete nor consistent enough to support a comprehensive determination of accident prevalence or risk. The Coast Guard was unable to provide the number of vessel types by year, making it impossible to quantify the population of small passenger vessels over the past 5-, 10-, or 20-year periods. The lack of such population data makes it impossible to calculate accident rates by vessel and event types. Many initial event types were generically categorized as “personnel casualty – injury.” In fact, that was the case for the fatal accident involving the diving vessel *Conception*. Only 16% of accidents involving fatalities and injuries in small passenger vessels were in the event data files provided. In general, the accident data included in vessel event and personnel casualty data were incomplete, inconsistent, or could not provide sufficient detail to support an estimation of small passenger vessel safety compared to other vessel types.

⁹ Because the initial event type “fouling” is categorized as either “contact” or “grounding/stranding,” staff grouped the NTSB categories “contact” and “grounding/stranding” into one category.

¹⁰ The category “others” included “abandonment,” “discharge/release – pollution,” and “sinking.”

¹¹ The NTSB Office of Marine Safety categorizes “vessel maneuver” as either “collision,” “contact,” or “grounding/stranding.” In this table, staff kept the original initial event type.