

**NATIONAL TRANSPORTATION SAFETY BOARD
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Public Forum

**Personal Flotation Devices in Recreational
Boating**

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SUBMITTED PAPER

Title: NTSB Boating Accident Forum
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NTSB Boating Accident Forum

Reducing the number of boating accidents and the number of fatalities that result from those accidents is unquestionably a worthy goal. To be effective actions taken to reach that goal must be soundly based on fact and avoid a journey into emotion.

EXECUTIVE SUMMARY:

The Present Situation:

- **Reducing fatalities in recreational boating is an unquestionably worthy goal**
- **Available evidence indicates that fatal accidents and drownings are closely correlated with boating experience and with boating education**
- **There is little evidence that boat size or type is a major factor in fatal accidents**
- **Drowning victims are overwhelmingly accidental swimmers**
- **Use of today's PFDs will reduce the incidence of drownings, IF THEY ARE WORN**
- **Available evidence shows that boaters do not wish to wear today's PFDs in other than special circumstances-PWCs**

Recommended Corrective Action:

- **Better educate boaters above the age of 20, especially those older than 30**
- **Encourage "real world" on the water boating training / practice for persons new to boating**
- **Technology is available for development of an inexpensive, no maintenance, one-time use constant wear automatically inflated emergency buoyancy aid. The Coast Guard should be tasked to work with industry to encourage the development and manufacture of this device and to promote its voluntary use by boaters.**

THE DIMENSIONS OF THE CHALLENGE:

According to US Coast Guard recreational boating data there have been an average of 762 fatalities per year during the 10 year period 1993-2002 including an annual average of 524 drownings, 68% of total fatalities.

PFD Use:

17% of those who drowned were wearing a PFD, 83 % of those who drowned were not wearing a PFD. The Coast Guard has presented an estimate that 83% of those who drowned would have

survived had they been wearing a PFD. In my opinion this estimate is open to question. Examination of PFD wear rate data does not indicate willing acceptance of today's PFDs by most boaters.

The 2003 National PFD Wear Rate Observational Study Data shows:

- Overall PFD wear rate over 6 years = 22.1%, including PWCs
- Overall PFD wear rate w/o PWCs = 17%
- Adult PFD wear rate w/o PWCs was between 8.5% and 10.9%
- Adult PFD wear rate w/o PWCs for speedboats / runabouts was between 3.9% and 5.5%, for cabin cruisers 1.2% and 2.0%
- Adult PFD wear rate w/o PWCs for small sailboats was approximately 39%, for cabin sailboats about 12%
- Adult PFD wear rate w/o PWCs increases with decreasing temperature, increases with increasing wind, wave height and perception of current strength
- Note: The USCG interim PFD rule of December 2002 mandates PFD use among boaters less than 13 years of age on all recreational boats while the boat is underway unless the child is below deck or in an enclosed cabin (US DOT 2002). PFD wear rate for the 0-5 year group = 88% and 75% for the 6-12 year old group

Influence of Boating Education on Drowning Fatalities:

Analysis of the 524 drowning death information discloses that 80% percent of the fatalities involved persons who appear to have had no boating safety instruction.

If Education Influences Safety The Predominant Education Problem Appears To Exist Primarily In The Adult Population:

- 86% of the drowning fatalities involved persons over the age of 20
- 20% (108) were between 30 and 39 years of age
- 18% (93) were between 40 and 49 years of age
- 16% (83) were between 50 and 59 years of age
- 15% (79) were between 20 and 29 years of age
- 10% (55) were between 60 and 69 years of age

Drowning Risk Related To Size / Type of Boat:

While the risk of drowning may appear to relate to the length of the boat involved in the incident no correlation between length and percent of total boat population is presented in the C.G statistics. The available data shows:

- 48% (254) involved boats not more than 16' in length
- 34% (433) involved boats > 16' and not more than 26 feet in length
- 4% (19) involved boats >26' and not more than 40' in length
- 4 drownings involved boats more than 40' in length

Distribution of Motorboats Boats By Size

- less than 16 feet 46.8%

- 16' to <27' 49.1%
- 27' to <40' 3.6%
- >40' 0.5%
- Data from USCG Statistics, 1998

Distribution of type of boat as a % of total boats registered (12,854,054):

- 63% (8,083,405) outboard powered
- 12% (1,526,855) sterndrive powered
- 12% (1,511,224) inboard powered
- 5% (585,946) PWC
- 3% (409,795) classified as “other”
- 2% (317,619) canoe / kayak
- 2% (211,258) auxiliary sail
- 115,324 sail only, 92,628 rowboats

Based on the above population distribution the risk of drowning does not appear to be overwhelmingly a function of boat type:

- 58% (307) involved open motorboats
- 12% (67) involved canoe / kayak
- 6% (34) involved a rowboat
- 6% (30) involved a cabin motorboat
- 4% (21) involved a PWC

Distribution of drownings by type propulsion of boat:

- 67% (353) were from a powered boat
- 2% (98) were from a manually propelled boat
- 1% (46) propulsion type unknown
- <1% (24) water jet
- <<1% (3) sail

The distribution of boats by type of propulsion by type of power may indicate that the number of drownings correlates with the distribution of boat population and therefore the number of people participating in boating activities, assuming that outboard and stern drive boats are predominant in the 26 foot and less category.

Accident Risk As A Function Of Boating Experience:

Of 750 fatal accidents, 9% (70) had less than 10 hrs experience. 16% (117) had between 10 and 100 hours, 34% (254) had between 100 and 500 hours experience. Only 1% (8) had more than 500 hours experience. A total of 301 accidents involved persons whose experience level was unknown. Re-computing the percentage of accidents as a function of boating experience yields quite different results; 15.6% of those involved had less than 10 hours, 26% between 10 and 100 hours, 56% between 100 and 500 hours and 1.7% more than 500 hours time on the water. A useful summary of this data shows that 41.6% had less than 100 hours and 98.1% 500 hours or less. These data may indicate that boaters involved in accidents leave the sport,

eliminating themselves from the group of boaters who go on to amass more than 500 hours of boating experience.

Aviation accident analysis (Nall Report, AOPA Air Safety Foundation) provides some parallel information about experience level effect on accident rates: “This year, ASF correlated total and fatal accidents in 2002 with the reported hours of experience of the pilot in command. Not surprisingly, pilots with 500 or fewer total hours accounted for 37.3 percent of all accidents, and 30.8 percent of fatal accidents, while the absolute lowest involvement in fatal accidents was by pilots with between 2,001 and 2,500 total hours. ASF studies have shown that low pilot time in type is often a significant contributing factor in accidents. Transitioning to a new aircraft, even one that is less complex, can cause problems for experienced pilots as well as novices.”

Preparation For Drowning:

Persons who drown are with few exceptions accidental swimmers. Capsizing and falls overboard are highest reported cause of deaths;

- capsizing = 40%
- falls overboard = 34%
- collisions with other objects =26%

COMMENTS ON DATA:

The statement that lack of knowledge as indicated by absence of boating instruction is at the minimum a contributing factor in 80% of the recorded fatalities seems reasonable and is supported by the experience distribution of persons involved in accidents.

The largest percentage of drownings (86%) involved persons over the age of 20 and in particular over the age of 30. This percentage distribution may correlate with the boating population distribution and with the fact that mandatory boating education requirements are imposed only on the younger participants and in many cases have not been in effect long enough to have required training for persons more than 25-30 years of age.

82% of the drownings involved boats 26 feet in length or less, a number that appears to correlate with the size distribution in the boat population and therefore does not necessarily indicate any direct relationship between boat size and risk of drowning for boats smaller than 27 feet.

67% of the drownings were from a powered boat, 58% involved open motorboats, numbers that may correlate with the distribution of boats within the overall population.

74% of the drownings were caused by capsizing or falling overboard and may correlate inversely with boat length / overloading / stability.

Although it may be reasonable to assume that wearing a PFD of some type will reduce the incidence of drowning for those people who unintentionally enter the water 17% (82) of those who drowned were wearing a PFD. We find no data that supports the assumption that a predominant number of the 83% of drowning victims who were not wearing PFDs would not have drowned had they been wearing one.

INITIAL CONCLUSIONS;

Boating education, especially of those older than 20 who have as yet not participated in boating courses would likely reduce the number of accidents and drownings.

I believe it unreasonable to assume that a rule mandating wearing of today's PFDs would necessarily have an overwhelming effect on the number of drownings. It is probable that such a rule would meet with substantial non-compliance by boaters. At the same time there is no doubt that the wearing of a PFD or immediate access to some other type of flotation device will reduce the number of drownings. The challenge is to devise a flotation aid that will be useful to a conscious accidental swimmer, accepted by most boaters and inexpensive enough to be in the possession of most boaters.

Surveys Of PFD Use Indicate That:

There appears to be little question that existing C.G. approved PFDs are not well accepted for continuous wear by the adult boating public.

The history and record of command and control based attempts to modify the behavior of our citizens does not bode well for a successful outcome of an attempt to force the wearing of PFDs in all types of boating activities. However, boaters appear to accept what they perceive as a reasonable safety / behavior mandate such as wearing of special purpose flotation gear when riding on or operating PWCs where the use of such devices is (a) unobtrusive, (b) appears to be reasonable and (c) is in keeping with their desired self-image.

We can expect boaters to reject blanket PFD wear rules where they perceive an unacceptable discomfort factor due to restriction of movement, thermal discomfort and a negative personal image created by the wearing of such devices. In addition efforts to enforce mandatory wearing on all boats will result in undesirable hostility toward the law enforcement community.

Boaters are reasonable and responsible citizens and will support efforts to improve boating safety if the need for their cooperation and participation is made clear and presented in an attractive, non-threatening manner.

It is reasonable to assume that a minimally intrusive, minimum cost, automatically actuated emergency flotation aid could reduce the number of drownings, especially if it was willingly accepted for wear by the adult boating public.

It is necessary to realize that rules and laws, no matter how well drawn or enforced will not eliminate all of the risks and consequences of any activity. We will never reduce the accident or fatality level to zero.

The record of safety improvement achieved in airline, military and general aviation provides a useful a model for a coordinated effort to improve boating safety. The analysis of boating accidents and fatalities needs to be more closely modeled on the procedures used in aviation if the data is to have real value in disclosing both the underlying cause of the incident / accident / fatality and to be of use in avoiding future incidents and accidents.

The day-to-day benefits of boating education and knowledge need to be publicized. Where additional safety rules and regulations are agreed by both regulators and representatives of boating citizens to be required they must be made minimally invasive and presented to the boating public in a manner that makes it clear that they are in the best interest of the individual boater, not the unnecessary intrusion of an unwelcome nanny state.

A POSSIBLE MEANS FOR REDUCING THE INCIDENCE OF ACCIDENTAL DROWNINGS

The drowning victim is first an accidental swimmer. Anyone on a boat, a dock or a seawall qualifies as a potential accidental swimmer. I believe we can use technology to minimize the chance that a swim will become life threatening by automatically providing the swimmer with an instant equivalent of a floating log. This device will not comply with any of the existing requirements for PFDs, however it will be eminently wearable, unobtrusive in the extreme, low in cost and require no maintenance whatever. It will require some new thinking on the part of the boating industry and in particular the USCG and the boating law regulators in the various states.

The flotation aid device I envision will be about the size of a pack of cigarettes and weighs only 2-3 ounces. It will be worn on the belt or high on a person's arm. When immersed in water to a depth of more than 12 inches an inflated mylar bag approximately 6" in diameter and 24" long will emerge from the package, ready for use as an emergency flotation aid. The device should be sold for approximately \$10, have a usable life of at least 5 years and will be discarded at the end of that time.

The technology required to produce this device already exists. The mylar balloons found floating hundreds of miles off the US East Coast testify to the suitability of mylar in this application. The approximately 24 pounds of flotation provided by the 678 cubic inch float should be sufficient to allow a conscious adult to keep his head above water. Inflation is from a cold gas generator of the type used to inflate side curtain air bags in automobiles. Inflation is triggered by a pressure sensing switch that operates when exposed to more than 10" of water pressure. The switch is unaffected by rain, spray or humidity. When required an electrical pulse from the unit's lithium battery triggers the gas generator. Float inflation is rapid, requiring less than 2 seconds and does not present an impact hazard as it inflates.

When developed the device should be approved for carriage in carry-on baggage on commercial aircraft to encourage those embarking on trips to remote boating locations to take their personal flotation aids with them. It is also desirable to allow boaters who regularly wear conventional CO₂ inflated PFDs to carry them with them when they fly to boating locations away from home.

2328 words

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