



# Foundation Findings

A Boater Education Series

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## Foundation Findings Report # 30: May 1998 - **Inflatable Life Jackets make the grade**



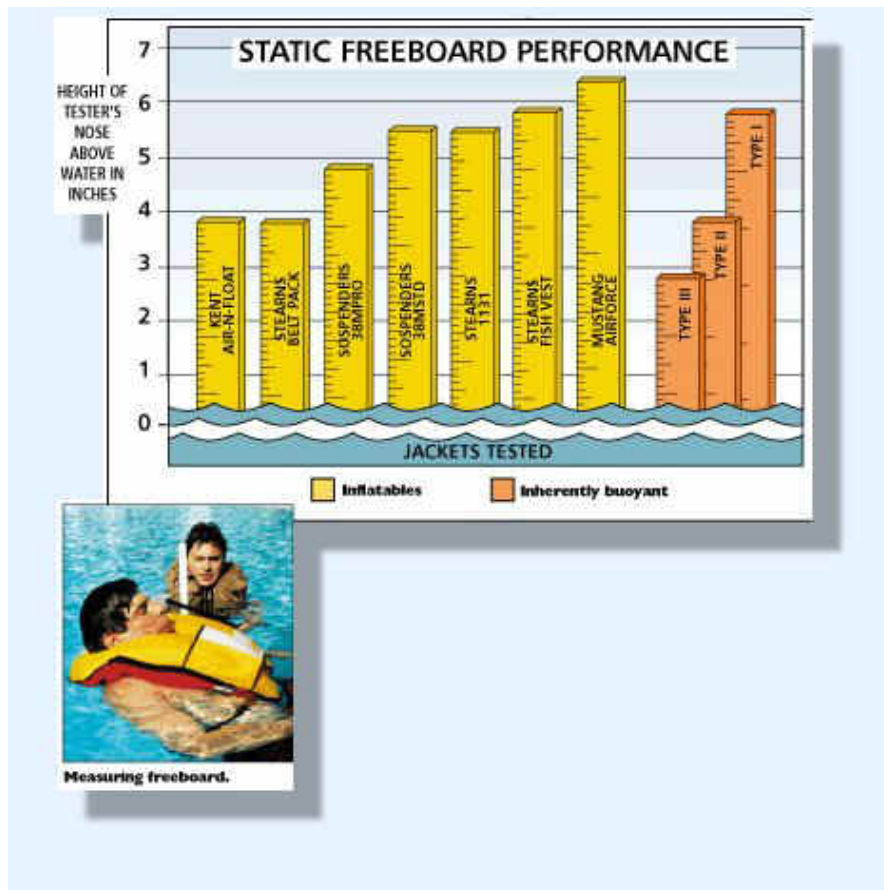
Equipment tested (top row, from left to right) Stearns 4444, SOSpenders 38MPRO; (middle row, left to right) Mustang AirForce, SOSpenders 38MSTD, Kent Air-N-Float; (bottom) Stearns 364 Inflate-Belt. Prices range from \$50 to \$135.

After more than a decade on boating's most-wanted list, U.S. Coast Guard approved manual inflatable life jackets are now available and coming on the market in earnest.

This means that recreational boaters can now meet federal life jacket carriage requirements with reliable, comfortable and "wearable" equipment that could have a significant impact in reducing boating fatalities.

Coast Guard statistics show that over 75% of all boating fatalities result from a person falling overboard and drowning. BoatUS has been pushing for federal approval and widespread production of moderately-priced inflatable life jackets because the Association is concerned that many boaters who would not wear bulky life jackets will choose to wear these lightweight and compact devices.

Since most boaters will not be able to try out an inflatable before they make a selection, the BoatUS Foundation decided to conduct in-the-water tests on an array of the readily available devices. What follows is their report on what these devices are really like in actual use.



**Freeboard (height) of tester's nose above water in inches.  
Freeboard changes from user to user - check your life jacket,  
and see how you "measure up".**

### New/Old Technology

Unlike the familiar inherently buoyant Coast Guard-approved vest or yoke-style life jackets, inflatables use a carbon dioxide (CO<sub>2</sub>) cylinder to blow up an air bladder with the tug of a lanyard. The bladder, which in most devices encircles the neck, is cinched to the torso with straps and keeps the user's head and mouth above water once inflated.

Although inflatable life jackets have been widely used on military and commercial aircraft for over 50 years, and have been common on recreational vessels in Europe for a couple of decades, the Coast Guard stamp of approval only came in September, 1996.

This isn't to say that life jackets that inflate with a CO<sub>2</sub> cylinder weren't on the market in the U.S. They were. A number of companies have been producing inflatable life jackets for some time and foredeck crews on ocean racing yachts have used inflatables for years. But they were not Coast Guard approved and could not count toward federal carriage requirements.

### Taking the Test

This *Foundation Findings* test was limited to manually-activated life jackets which inflate by pulling a lanyard. Since life jackets that inflate automatically upon immersion are not yet Coast Guard approved, we did not include them in our test.

We compared seven inflatables from four manufacturers in both calm and rough water conditions. All seven were Coast Guard Type III life jackets.

Inherently buoyant Type III's, the familiar vest-style life jackets intended for supervised activities where help is near at hand, must provide a minimum of 15.5 pounds of buoyancy. Inflatable Type IIIs, however, must have at least 22.5 pounds of buoyancy and all our test models exceeded that standard.

For our calm water testing we used a hotel swimming pool. And for the rough water tests, we used the wave pool at Walt Disney World's Typhoon Lagoon in Orlando, FL, hosted by Wayne Mitchell, Disney's senior safety administrator and a member of the National Safe Boating Council.



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We knew going in that all of the life jackets met Coast Guard certification standards. They should inflate on demand, float the average adult with the head out of the water and turn most people face-up.

While we did measure performance characteristics like inflation time, we were most concerned with some of the more subtle characteristics of approved manual inflatables.

Are they easy to put on and adjust? Are they comfortable to wear in normal boating activity? How do they feel when worn inflated in the water? And, very important, we wanted to find out how easy it is to rearm each model after discharge and repack it to its ready state.

For testing, we selected two models of SOSpenders, a Stearns Model 1131, a Kent Air-N-Float and the Mustang AirForce. To that we added a fishing vest-style inflatable and a belt pack unit, both by Stearns. And for comparison, we brought along three conventional Coast Guard approved inherently buoyant life jackets in Types I, II, and III.

### **Performance Factors**

An inflatable life jacket properly adjusted and fully activated is tough to beat when it comes to keeping you afloat and safe. All the inflatable achieved fully deployed status within the five seconds called for in the Coast Guard standards.

In the calm water test, we used a 220 pound male, a boater who is familiar with inflatables and a good swimmer. (Inflatables are not recommended for non-swimmers and are not approved for children and people who weigh less than 90 pounds.)

We measured the freeboard between the water and the subject's nose (see graph) the face angle, the angle at which the device held the subject's head relative to the surface of the water.

In addition, we measured turning moment, the time required for each unit to turn our test subject from face-down in the water to a face-up position with mouth and nose clear of the water.

With the exception of inflation rate, we compared these performance factors against the inherently buoyant life jackets. The bulky but dependable Type I offshore life jacket has always offered the most protection and it became the bellwether for our comparisons.

In the turning moment test, the inflatables as a group performed better than the inherently buoyant life jackets with an average time of 4.5 seconds. (The Coast Guard standard is 6.5 seconds for 80% of users) By comparison, the inherently buoyant Type I turned our test subject over in 6 seconds.

In the face angle test, the inflatables floated our subject from 55 degrees to 35 degrees as measured from the water's surface behind the head. There is no Coast Guard face angle standard for Type III inflatables but with the Type I inherently buoyant life jacket our subjects' face angle measured 40 degrees.

For good measure, we added a jump test with arms overhead and each device in the ready position. All stayed on our subject as originally adjusted and each deployed as expected when the subject triggered the devices from a few feet below the surface.



## Rough Water Tests

For rough water testing at the wave pool, we used three certified life guards from the Disney World staff, Andy Powell, Elaine Benson, and Rusty Tillman. (They were particularly interested in our tests since all three are also patrol boat operators on Disney World's Bay Lake and Seven Seas Lagoon.)

It was here that we got the most insight into the "user friendliness" of inflatables as all three subjects, completely unfamiliar with the device, experienced some difficulty donning the jackets on shore for the first time.

In seas up to four feet, all inflatables proved more than adequate to keep the test subjects' heads above even cresting waves. Everyone was able to maintain a heads-up position with little difficulty.

Our three test subjects reported feeling as safe wearing any of the inflatables in the waves as they did wearing the bulkier Type I inherently buoyant life jacket.

In fact, the type III inherently buoyant vest-style life jacket proved the real eye-opener for our test crew who had to work hard treading water to keep their faces clear of the waves when using this device. When another test was conducted simulating an unconscious victim, those wearing the Type III inherently buoyant devices repeatedly sank well beneath the surface as the waves rolled over them.

The big surprise in the big waves was the belt pack. Quite naturally, our testers found this to be the most comfortable to wear in its ready position on land. Once activated and adjusted in the water, they all loved it.

Donning the belt pack is a two-step process. The pouch is strapped around the waist and a yank on the inflation lanyard deploys the bladder. The wearer, treading water, slips the inflated bladder over the head and adjusts the

fit with a strap to the waist belt. While it may sound complicated, we found that it works surprisingly well.

Although we noted that wearers could place the bladder over the head backwards, with chest buckle and inflation tube against the body, each tester gave the belt pack high marks. It rated very comfortable in heavy seas when inflated, particularly since the waist belt tends to pull the bladder in to the body at a lower angle than the underarm straps of the conventional inflatables.

## **Rearm and Repack**

Boaters who choose to rely on inflatables must be thoroughly familiar with rearming the CO2 inflator. Each device is rearmed the same basic way but you must follow the instruction with your unit carefully.

The seven models in our test used three different sized CO2 cartridges. We found that it is possible to arm an inflatable life jacket with the wrong cartridge which could result in only partial inflation.

A small green status indicator tab shears off when the lanyard is pulled, revealing a red indicator that shows the unit has been deployed. We strongly recommend you remove the spent cylinder and dispose of it as soon as possible after use to avoid confusion later.

Before screwing in a new cylinder, the inflation trigger must be in the closed position. The green tab is inserted through the arm to show that it is closed. (These tabs are too small and fragile, we thought, for large or cold fingers at work in heavy seas or in the dark.)

After use, each vest-style inflatable repacks into its exterior fabric shell rather simply by following the instruction diagrams attached to the inside of the jacket. The belt pack must be folded carefully, accordion-fashion, into its pouch. We found we could miss-fold it such that the bladder became twisted upon deployment and therefore would not deploy properly.

For all models, hook-and-loop tabs hold the folded shell in the ready state and, if done properly, the inflation lanyard handle will dangle just enough to be grasped.

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## **Conclusions**

As we expected, all the inflatable life jackets in our test met or exceeded the Coast Guard minimum standards. In the more subjective area of "user friendliness", we found all the inflatables easy to don and adjust, with a little practice, out of the water. But in the water, they are significantly harder to put on. In fact, our tester found it next to impossible to don the uninflated units while treading water, emphasizing that the point of using inflatables is to WEAR them on-board.

Once inflated, we found the models with wider back straps more comfortable. Indeed, the thin straps on the Stearns 1131 quickly made our testers very uncomfortable. (In an emergency situation, however, comfort may be the last thing on your mind.)

Should you choose to equip your boat with this type of gear, we strongly recommend doing CO2 inflation "dress rehearsals" in the water with each member of your crew so they know how to don, adjust and activate their life jacket. That way they will not only know what to expect, they will gain confidence in the device. Investing in a few extra CO2 rearming kits would be money well spent.

All our testers agreed. If they had to drift around in the water, waiting for rescue, they would want to be wearing the bulky but tried-and-true, inherently buoyant Type I life jacket - but few boaters would want to wear a Type I in their everyday activities on the water. And now, at last, Coast Guard approved inflatables offer the boater an excellent option, superior performance in the water with a high comfort quotient on deck or in the cockpit.

But remember, inflatable life jackets are not fool-proof. They require more attention than inherently buoyant devices and you must be thoroughly familiar with their use. However, if you are willing to make the effort, the added buoyancy plus the "wearability" factor make inflatable life jackets an attractive safety option that could help deflate boating accident statistics--and maybe even save your life.

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## Inflatables Need Attention



***Remember to keep your inflatables in top condition!***

### **Inflatables need attention**

*Like every other piece of equipment on your boat, inflatable life jackets require periodic inspection and maintenance. The manufacturers recommend inspection by performing a leak test. Blow up the life jacket through the oral inflation tube and let it sit for 16 hours. IF there is air loss, it should be repaired professionally or replaced. (doing repairs yourself is ILLEGAL, and makes the life jacket subject to seizure.)*

*If the life jacket passes the leak test, check the straps, buckles and seams, and check the inflator mechanism to be sure it is properly armed with the correct CO2 cylinder. Unscrew the cylinder and inspect it as well as the inflator for damage and corrosion. Be sure to store the life jacket completely dried in a dry, well-ventilated place (and that may not be a locker on your boat)*

*For our testers, locating the firing lanyard and the oral inflation tube proved a minor problem a few times, particularly with the fishing vest. But that just points up the need to acquaint yourself, your crew and your guests with the nuances of inflatables.*

*Finally, every time you go out, make it a habit to check the status indicators to be sure the unit is ready. Even better, unscrew the CO2 cylinder to be absolutely certain the seal has not been pierced.*

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