Smoke Detectors: What's It Going to Take?

To the Editor:

In his Parting Shot essay "Smoke Detectors: What's It Going to Take?" (*Professional BoatBuilder* No. 168), Mike Telleria writes about following up on the recommendation from a surveyor for a smoke detector. If the surveyor had been knowledgeable, the recommendation should have required a detector that meets *NFPA* (National Fire Protection Association) *302: Fire Protection Standard for Pleasure and Commercial Motor Craft* (2015). He should have quoted from Chapter 13, Carbon Monoxide and Smoke Detection, Section 13.3, wherein it states: "All vessels with accommodation spaces intended for sleeping shall be equipped with a single-station smoke alarm that is listed to ANSI/UL 217 Standard for Safety for Single and Multiple Station Smoke Alarms for *marine or recreational vehicle use*" (italics are mine).

One also needs to look in the Appendix of NFPA 302, Section A.13.3. While an appendix item is not part of the standard and therefore not required, this appendix recommends that on vessels larger than 39.37′ (12m), means of detecting a fire in the engineroom be provided with a warning at the helm position. Anyone who has ever investigated an engineroom fire knows that even if the fixed system is installed and maintained properly (another story for another day, as in my experience roughly 80% are neither installed, sized, positioned, nor maintained properly), the chances of it putting out a fire are minimal. However, with ample warning, the required manual discharge pull could be activated. (PBB readers should know that *all* fixed systems must have a means of manual discharge.)

All surveyors, builders, and repairers should know that no smoke detectors currently available in the U.S. are tested for compliance with a marine standard. Most people probably don't know that there has been a proposed standard for more than 12 years for what specific characteristics this smoke detector should have in order to be listed and labeled a device for marine use under ANSI/UL 217. They are also probably unaware that the requirements to be listed and labeled for use in an RV under the ANSI/UL 217 criteria for RVs in almost all areas—including the most important ones like salt spray testing, vibration, false alarming, etc.—equal or exceed the proposed marine testing criteria.

An American Boat & Yacht Council committee has for at least 12 years been looking into publishing a standard for the proper installation of smoke detectors. At one time I was a member of that committee, but when I saw the same ABYC staff and committee members bring up the excuse "there are no smoke detectors listed for marine use," I soon realized I was wasting my time and energy. ABYC frequently references U.S. Coast Guard Recreational Boating Safety Statistics and asks, "Where are the statistics to justify such devices?" when referring to boat fires. Well, unless there is pollution or loss of life while under way, the CG does not report the fires on boats tied to the dock. However, *the Water Vehicles section of the NFPA Vehicle Fires Report shows that there were about six or seven times more boat fires than the USCG Recreational Boating Safety Statistics report.* This equates to tens of millions of dollars in property damage, personal injury, and occasional loss of life. And instead of going to the major marine insurance companies or the NFPA and asking them for their statistics, ABYC seems content to let the committee assigned the task of developing a smoke detector standard languish in obscurity. In fact, the National Marine Manufacturers Association in 2004 sent their technical VP to Salt Lake City, Utah, to try to keep the NFPA 302 (2004) standard from including a requirement for smoke detectors. Anyone see a pattern here? The question is why?

I hope that Telleria's Parting Shot inspires some renewed interest at ABYC, and they get off their proverbial tushes, pull their heads out of the sand, and come out with a meaningful standard, even if relies on the RV-listed devices already in vast use.

I also caution all surveyors to learn the standard for which they are writing a recommendation to address an issue on a vessel. Nothing is worse than having to appear in court, arbitration, or a deposition and make a complete fool of yourself because "you heard at a meeting that such and such was required."

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W17: Can Simple Hull Shapes Be Supported by Science?

To the Editor:

I enjoyed Mike Waters's article "W17: Can Simple Hull Shapes Be Supported by Science?" (PBB No. 169). As a multihull designer, I am familiar with lightweight, slender, low-drag hullforms and how they can exceed the "hull speed" phenomenon. My Seaclipper series of designs has used simple hull shapes, like the W17, and has shown success in sailing speed and simple construction for more than 30 years. I agreed with most of what Mr. Waters said until I got to the asymmetrical ama hull diagrams.

Mr. Waters suggests that asymmetrical ama hulls can produce lift to windward with the flat side to windward. I think Mr. Bernoulli (who wrote most of the laws of hydrodynamics in 1738) would disagree. In Mr. Waters's diagram in Figure 7, a Hobie cat hull is likened to a wing, with its curved side inboard, which (correctly) suggests that it produces lift. It probably does, but most of the pressure difference escapes under the keel. What *is* significant, however, is that the bow is angled slightly outboard so it reduces the bow wave as the boat makes leeway. That reduces wave drag, which is a significant component of hull resistance. (It should be noted that all boats have to make leeway to create lift on the keel or daggerboard foil. The only exceptions are those fitted with a "jibing" board that angles to windward, allowing the hull to travel straight without leeway.)

In Figure 8, Mr. Waters claims that with the curved side outboard, the hull will also create lift, and its larger outboard bow wave will "literally push the boat to windward." This is not supported by any of the laws of hydrodynamics; it is fuzzy science. Using the same logic as Figure 7, the lift will actually be to leeward. The bow wave, in fact, will create more drag since the bow is angled to windward when the hull progress is showing leeway. This hull cannot claim to be efficient if it lifts to leeward with increased drag.

It is worth noting that the asymmetrical "lifting" hullform argument was debunked 40 years ago by Buddy Ebsen's 37′ (11.3m) Choy-designed catamaran, *Polynesian Concept*. In races and sailing trials this boat with asymmetrical hulls showed no advantage over symmetrical-hulled catamarans of the same length. The boardless Hobie cat hulls are a compromise configuration to simplify beach launching and sailing through the surf. They make more leeway than other cats with daggerboards, but they sail reasonably well. The key is the "banana" hull profile shape (high rocker) that has considerable depth, allowing it to produce some lateral resistance.

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Mike Waters responds:

It's great to have John Marples raise the issue, as only by questioning and challenging claims can we learn what works, and we can try to match what science explains this, and proceed with some confidence. The phrase Marples uses, *fuzzy science*, is very apt. When you have all the variables that exist at the highly varying interface of water and air—due to waves of all shapes and sizes and caused by a multitude of different factors interfacing with different hull shapes that are constantly pitching and heaving—this is, and will probably always remain, a very fuzzy science, and even more magnified with very small boats. We should not ignore what's happening or avoid trying to explain it.

I apologize for not clarifying my sketches a little more. The analogy between a plane wing and a Hobie hull (Figure 7) was to explain only the *basic* concept behind the original asymmetrical Hobie hull design. I could have more justifiably compared it to a low-aspect-ratio (LAR) keel, as these also have poor efficiency, but lift from a plane wing is easier to visualize. A plane wing has a leading-edge-to-chord (Le/C) ratio often running into double digits, whereas that ratio for a Hobie hull is even less than 0.10. Tests on LAR keels have shown that when the Le/C ratio is less than about 0.25, the lift-to-drag is very low, unless one can add an endplate like a keel wing. And, unlike a keel, a Hobie hull (or trimaran ama) is also bobbing in and out of surface waves, so in my opinion, the Bernoulli theory just does not apply in any effective way to either; and as Marples correctly writes, "flat-side outboard" hulls do not perform better than symmetrical hulls, as was confirmed by tests with the early Choy catamarans.

> "...this is, and will probably always remain, a very fuzzy science, and even more magnified with very small boats."
> —*Mike Waters*

When the first W17 was launched in the Philippines, it was just before a local three-day race. The owner, although an experienced trimaran sailor, felt unready for this. As there is a large and internationally competitive Hobie fleet in the area, he lined up the Philippine Hobie National champion to sail the boat. It was by far the smallest boat in the fleet, the conditions were tough, and the boat was far from complete. But it was a start, and I was able to put some hard questions to the champion skipper afterward. Posted on my website for many years now, one important thing in his reply was that "the boat goes to windward much better than a Hobie cat." I already understood well what Marples repeated: that asymmetrical hulls like those of the Hobie *need* leeway to create lift, and also that the typical asymmetrical-hulled cats were not outperforming those with symmetrical hulls.

So what happens in the case of the W17 ama? Was the champion Hobie skipper simply feeling a difference between a trimaran and a catamaran? I've worked to answer that ever since.

The first day I launched my own W17 four years ago, I had to sail the boat singlehanded around a headland with a half-mile stretch back to my beach. With the commonly prevailing south wind, I could "just" lay it as I headed south southwest. I had done this a hundred times before with my high-performance, symmetrical, round-bilged *Magic Hempel*. While I was able to sail high enough to point to my home, the inevitable leeway would always have me ashore too early, so a tack or two became inevitable. But on that very first trip, I sensed there was something different about the W17. I was again able to lay my place from the headland, but for the first time, I made my home in one tack with even some space to spare. I had an experienced sailor friend on the beach who was able to see me make that last half-mile from head-on, and I asked him if he saw any side slip. His reply confirmed what I had sensed from the boat itself: he not only said no but added, "Sometimes you even seemed to be sliding to windward!" I have watched this phenomenon repeat itself many times over the last four years, and in taking out 39 different sailors on test trials, about two-thirds of them have remarked on how negligible the leeway seems to be. So at this point, I have no doubt that the ama hull shapes I have developed actually *do* work.

Now the question, through whatever fuzzy science we can come up with, is why? First, realize that it's only the first few inches of ama depth that are truly asymmetrical. The decks themselves are symmetrical, and there's no large exterior bow wave either. So I see the slight curvature presented to the oncoming water more in the way a curved ski develops a side force when carving turns. Water passes the inboard flat side in a parallel flow with no apparent side displacement.

As to the question of toe-in, I may be one of the only tri designers to use it, but I came to this by accident. Back in '89 just before I bought her, *Magic Hempel* was shipwrecked during the Swiftsure Race in the Pacific Northwest when a waterstay fitting failed, causing the main aluminum beam to buckle at the hull. Kurt Hughes bought her inexpensively, and to get her back in the water fast and keep the repair simple, he had about 2″ (51mm) cut out of the beam, and with a sleeve, had the beam welded up but now 2″ short on one side. Over the 23′ (7m) length of the ama it was just not visible—until you put a tape measure to the beam. This I did a couple of years after owning her when trying to explain to myself just *why* the boat seemed to climb better to windward on that tack. I then came to realize that many trimarans actually sail with their ama bows pointed *outward*, as they are often set up parallel to the main hull centerline when measured at the deck. But when you take into account the typical 10° of inward inclination of many ama hulls and the fact that the stem is much higher than the stern, the actual centerline at the waterline is really pointing outward. All my trimaran designs now have toe-in to correct for this, as well as a little more to *push* upwind a bit. (Too much would cause excessive drag, of course, as did a jibing board I created way back in '54.)

All these observations have guided me in the development of the W17 ama hulls, and all I can positively confirm to Marples and other readers is that they *do* work as intended, with low-leeway being only one of several advantages. As to defining the fuzzy science that explains this, I can only offer the ski analogy or thinking of it as a very shallow jibing board at the bow of the ama underwater. For some years now, there have been several references to this windward ability in the comments on my website, www.smalltridesign.com, under "What sailors are saying," so readers are invited to check it out.

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