

LEE HELM

Max has, like, done it again. He gets invited to navigate the Marion to Bermuda Race and leaves me back here to write his column for him. And I don't know why they even think he can navigate — all he'll do is look at the GPS and do what the pre-race weather router told him to do. It's, like, only 600 miles from Massachusetts to Bermuda. He had to get a crash course from me on celestial calcs, 'cause that race still requires a couple of celestial fixes to be worked. As if I have the cycles to spare. But heck, I guess he has done me some favors since I've been here in grad school.

The first I knew about this was a couple of nights ago. I was up late writing a subroutine (can you believe still in FORTRAN?) when I get this text message: "What's a Newton?" So like, of course I type back "A famous 17th Century mathematician and physicist, or a fig cookie made by Nabisco," and like, he texts, "No, I mean for lifejackets."

Well *duh* — what else would he mean? I deduced that Max was reading the latest edition of the *Offshore Special Regulations*. Starting last year, all PFDs have to have thigh or crotch straps, and the buoyancy has to be at least 150 Newtons. Since I was already at the keyboard, I told him to switch to email.

"A Newton," I had to explain, "is the force you get when you accelerate one kilogram-mass at one meter per second squared. From Newton's $F=MA$, which is why it's named after a cookie."

Yes, I know: he just wants to figure out how many pounds buoyancy he needs in his PFD. But get real. I can't let him off that easy when he asks a dumb question he could just as easily figure

"What's a Newton?"

out himself or get from any one of a zillion websites.

He doesn't respond for a few minutes. I give up and send him the actual answer: "A pound of force is one pound-mass accelerated at one G or 32.2 feet per second squared, and a kilogram-mass is 2.2046 pound-mass, and a meter is 3.2808 feet. You get one Newton = $2.2046 \times 3.2808 / 32.2 = 0.2246$ pounds, or one pound = 4.45 Newtons. Your PFD has to have 150 Newtons buoyancy, and that works out to 33.7 pounds."

Hey, don't worry, this article won't be like last month when Max confused



everybody trying to explain my theory of second moment of inertia and why keels fall off.

"Hmm. I have a feeling this is the end of the road for my trusty old Type III fishing life vest," he typed back. "I like it because it has the pockets for my strobe light and VHF and spare flashlight (I hear that helicopter pilots hate strobes). And it's foam, so it's 100% reliable."

A quick web search, and I had some numbers for Max.

"Your Type III fishing PFD only has 15 pounds of buoyancy. Sure, that holds your head above water in flat calm, but there's no margin for heave response in waves. You really want those extra Newtons to keep your head above water when the water is going up and down faster than your body."

"I wonder if anyone makes a Type I that's comfortable enough to wear," he typed back. "I still don't trust those in-

flatables, and I hear it's hard to get the cylinders through airport security."

I pointed out that, like, even a dorky old Type I PFD at 22 pounds doesn't meet the new standard. But he mentioned airport, so I had to ask where he was going, and that's when he started to brag about navigating the Bermuda race — while I'm stuck working on my thesis and writing his column for him, too.

"The OSR wants a crotch strap or thigh straps, even on the PFD," he complained in his next message. "That pretty much means it has to be a PFD-harness combo. But I can't find any that have the required straps."

Max sent me the URL of the new *Offshore Special Regs*. Yes, they really are requiring straps on all PFDs. "I'm going to have fun inspecting boats for the Pac Cup next year," I thought. "Everyone's illegal!"

"It doesn't say here that the straps have to be factory-installed," Max wrote back. "I think we'll see a lot of aftermar-



LATITUDE/JR

Crew going overboard — and how to get them back — is a problem that has vexed sailors for centuries. New technology increases the likelihood that more people can survive such incidents.

ket crotch strap kits."

But this turned out to be a false alarm. Max was reading from the ISAF site, probably because Google brings that one up first. I mean, like, that's what US Sailing gets for being last to put their docs online, trying to get people to pay for dead-tree editions. With a little data-mining at the US Sailing website I found the version with the US prescriptions: The crotch/thigh strap thing is downgraded to a recommendation, not a requirement, so everyone can ignore it. Max had to go back and check his Notice of Race to figure out which version of the OSR is being used for Bermuda.

"No crotch strap needed," he typed back. "But I sure wish someone made a hybrid inflatable PFD-harness combo

with a few pounds of foam buoyancy in case it doesn't inflate, and some nice big pockets, and the recommended spray hood."

"For sure," I sent back. "It would look like a kind of thin Type III, maybe with eight or ten pounds' foam buoyancy, with lots of pockets, and the built-in harness and the inflatable collar to bring the total lift up to 33.7 when you need it."

"One pocket should be designed for a handheld VHF, with a Velcro closure," he typed. "And maybe even another pocket designed for one of those new personal GPS-EPIRB units. Remember, I don't know this crew that well, and I don't know how good they are at recovering people overboard."

"I feel your paranoia, Max. But do you want to alert the whole EPIRB rescue network if you're just going for an accidental swim around the boat? Think locally if want to be rescued locally. Give me a few minutes to dig up some info on these things."

There were no more communications for the next half hour as we both searched for ways to fall overboard at night in rough weather in the middle of the ocean and not die. Some good stuff is out there. And some really expensive stuff too, perfect for those wallet-driven big-boat programs. Then I thought of a possible problem with, like, a recursion in my subroutine, and I was happily debugging when another text message from Max popped up.

"You still up? Answer your email!"

"Sorry, got distracted."

The most recent email from Max described one interesting system: "Each crew wears a little electronic pendant, and if the onboard base unit fails to detect any one of them within range, it sounds an alarm."

I followed the link he sent to the website. It turned out to be kind of pricey, and I was hoping the pendants would look like tiny little electronic key fobs, with a passive re-radiator like a library book RFID tag. Instead they're clunky things more like the size of those old wristband radios, and they have batteries in them that need to be checked.

"If you have the compatible instruments, it will enter the MOB waypoint into the chartplotter and even zoom in to a large-scale plot," Max emailed.

"Does it also run a DR for the MOB?" I typed back. "If the boat has the usual instrument package, it knows the current vector and should be able to keep track of where the MOB is drifting."

"Doesn't look like it," he answered.

"I could program that function into the boat's laptop, no prob," I suggested.

"Here's a review website that complains the alarm isn't loud enough to hear over engine noise," Max typed along with a URL from a site that does boat and equipment tests, usually by powerboat-

"I feel your paranoia, Max."

ers. But they fail to suggest the obvious, wiring it up to cut the engines instead of sounding an alarm."

"Watch out for over-integration," I warned. "If the wave that knocks you off the boat also takes out the main instrumentation network . . ."

That kept the wires quiet for a while. Then Max came back with another website for me to check out.

"Here's an MOB warning system that

URLS OF INTEREST

www.acrelectronics.com — ACR Electronics (EPIRBs and PLBs)

www.Boattest.com — BoatTEST.com (Reviews and review videos, by power-boaters)

www.mobilarm.com — Mobilarm VPIRB (water activated DSC VHF/GPS MOB signal)

www.usna.edu/SailingTeam/training/lectures/2008/SAS/SAS%20Communications%202008%20Final.ppt — Naval Academy slide show (tutorial on new communications, search and rescue systems)

www.nke.fr — NKE (wireless MOB medallion interfaced with autopilot controller or NKE instruments)

www.raymarine.com — Raymarine LifeTag (wireless MOB pendant interfaced with Raymarine instruments)

www.findmespot.com — SPOT (Globalstar subscription rescue beacon using satellite network with mostly terrestrial and coastal coverage)

www.standardhorizon.com — Standard Horizon (Handheld DSC VHF/GPS)

talks to the autopilot — it will turn the boat head-to-wind when one of the medallions goes out of range."

"Hmm . . . I don't know if turning head-to-wind by surprise is always such a good idea. Even for cruisers."

"Or if another boat is to windward."

"Might be okay under the old racing rules, but not now."

Max agreed that it makes more sense to have the alarm cut power, enter the waypoint and start the running MOB DR instead of taking out the spinnaker and/or the boat to windward with an automatic luff and heave-to. But he also pointed out that none of those systems served his immediate requirements anyway, because it's, like, not his boat, and even if he wanted to spring for the whole system, he only gets there a day before the start. So he was pricing out personal pocket-size EPIRBs, stand-alone units that call up a global rescue network, and it sounded like he was almost ready to order one.

"Have you heard of this SPOT system?" he emailed. "Looks like a cheaper alternative to a personal EPIRB, and you can signal that you're okay."

"That one uses the Globalstar satellite network," I replied after checking up on it. "Might be okay for Bermuda, but coverage doesn't reach Hawaii. And there's an annual subscription fee. I don't think it's a good substitute for an actual EPIRB, if you want to activate shore-based rescue. And it doesn't communicate back to the boat you fell off, or to any other boats in the area."

Max then suggested he get a personal EPIRB or PLB — Personal Locator Beacon.

"If you need the cavalry to charge

over the hill and save the day like in the movies, then yeah," I advised. "But if I fall over in warm water and I'm not hurt, I don't want them to trash a spinnaker with a quick stop, and I don't need the Coast Guard helicopter, either."

"That says I should stick to my little handheld VHF," Max typed. "I can communicate urgency or lack thereof, and I can talk them back to me after a normal spinnaker douse."

"What you really want is a handheld DSC unit," I suggested. "Digital Selective Calling. If they make a handheld DSC that also has a built-in GPS, and does the full DSC protocol, you can send the MOB distress code to the boat you fell from, and to anyone else in VHF range. And your position can be updated as you drift."

"Do they make such an animal?"

I let Max do the Googling while I tried to get some more work done.

Eventually he emailed that he had found only one model that seemed to combine all the features he needs: Handheld, submersible, DSC, integrated GPS, alkaline battery tray.

"And not too expensive," I added with tags indicating it was to be read in Michael Palin's falsetto voice.

"It even says it has a built-in strobe light."

"Don't put all your eggs in one battery tray," I typed.

"Okay, I ordered it," Max confirmed 10 minutes later. "Although I still wonder if I should have a personal EPIRB, in case we're all in the water after a real disaster."

"If you were singlehanded, sure" I typed. "But you don't want to cry wolf when the emergency can be easily

handled locally. VHF range is a good match to all the boats close enough to help — as long as the fleet has mostly DSC receivers, and mostly keeps them turned on."

"But what if I'm knocked unconscious by the boom? Maybe I should also have one of the MOB alarm systems."

"If you were doublehanded or cruising, sure," I typed again. "They make sense if you're going to be on watch alone."

The wires were quiet again for a while, then he asked me to look at one more gadget. This one turned out to be a kind of dumbed-down VHF/GPS combo — a small, stand-alone, wearable unit, water activated, with DSC distress transmission and GPS position. . . but no voice.

"I'd kind of like to be able to talk the boat back to me, or tell them if I'm okay or if I need help right away," I answered. "Seems silly to have a DSC/VHF/GPS with no voice capability."

"Here's what we really need," Max typed. "First, a tiny little RFID key fob that does only the alarm function. No other bells or whistles, and I'd want the base unit to have its own batteries in case ship's power is down. Then, a handheld DSC/VHF/GPS like the one I just ordered, but combined with a personal EPIRB, manually activated, for when the situation gets more serious."

"You'll need more Newtons for all that hardware," I pointed out. And that he would still have to be, like, conscious to activate the EPIRB after the local rescue attempts went south. He came back with schemes for time delays after water activation, or an EPIRB activation signal back from the boat, or other algorithms and protocols to escalate from the local VHF distress hail to the global EPIRB distress call.

Then he started babbling about the weather patterns between Massachusetts and Bermuda.

"On the one hand," he typed, "there is really good data for the Gulf Stream meanders — not much guesswork involved hitting the Stream just right these days. On the other hand, the Bermuda High can move fast, and the New England weather patterns can change quickly."

On the other other hand, why would anyone sail 600 miles upwind to Bermuda when they could sail 2,000 miles downwind to Hawaii?

— lee helm