Going the Distance

A GLOBETROTTING NORDHAVN 52, *DIRONA*, OFFERS A CASE STUDY IN RANGE & CONSUMPTION PLANNING FOR LONG-RANGE CRUISING.

BY JAMES & JENNIFER HAMILTON

James Hamilton

You never truly know your boat's range until you start to make substantial ocean passages. Theoretical range in flat water with no current and little wind can be surprisingly optimistic so we probe the bounds conservatively. Our 19-day, 3,023-mile Indian Ocean crossing from Dampier, Australia, to Rodrigues, Mauritius, is the farthest we have ever gone between fuel stops.

Still, it's only a small and fairly safe extension of our previous longest run when we trekked 2,600 miles between Hawaii and the Marquesas Islands. On that run we stopped and visited both the Palmyra Atoll and Fanning Island, so the actual open ocean crossing distance wasn't longer than previous trips. Prior to our Indian Ocean crossing, the longest unbroken offshore run we have completed was 2,000 miles from San Francisco to Hawaii.

GAUGING PERFORMANCE

Every crossing brings new data and more experience. On this last run the most interesting lesson was that our range is much greater than we previously understood. Or, for a given distance, we will be able to travel it faster. When underway, we use the engine control unit (ECU) that reports fuel burn numbers to control our speed and help ensure we arrive within the intended margin for safety. We've been told these numbers are very accurate and we have tested them and verified numerous times that they are indeed incredibly precise.

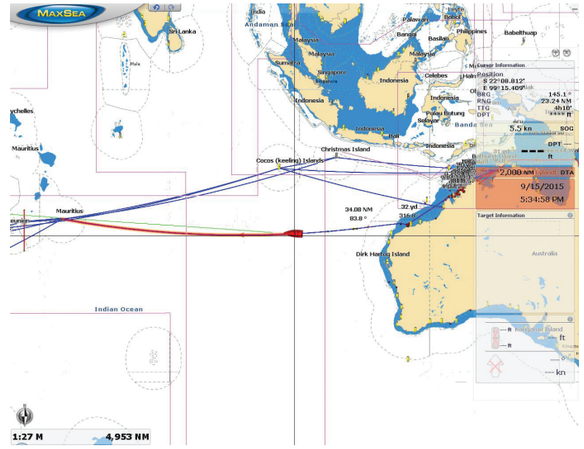
In addition, we hand-calibrate sight gauges by filling the tanks from the bottom to the top in 25-gallon increments, marking the sight gauges on each increment, so they are now quite accurate. We also have installed a Maretron FPM100 Fluid Pressure Monitor that we use to measure hydraulic system pressure, transmission system pressure, as well as tank levels. To measure hydraulic pressure we use a Setra 0-5,000 PSI sensor. To measure tank levels, we use, depending upon the fuel depth in that particular tank, either a Setra 0-2 PSI or a Setra 0-3 PSI sensor. These also require calibration by filling the tank, this time in 1/16 of a tank increments. But, once calibrated, the FPM100 provides approximately +/-3 percent accuracy. On large tanks, such as fuel tanks, that's an impressive degree of precision.

With a combination of the sight gauges and the Maretron FPM100 electronic gauges, we have a fair degree of confidence in the quantity of fuel we have aboard. This level data is far more precise than we have had in past crossings. What we have learned over the past year using these fairly precise indicators is that the John Deere ECU-reported fuel economy is very accurate. Prior to this trip, we had been able to detect no variance among the sight gauges, the electronic tank level sensors, and the ECU-reported fuel burn. But, on the Indian Ocean trip, the ECU-reported burn was 13 percent higher than the actual burn.

The cause of the surprising discrepancy is that in coastal cruising, where we are operating at higher engine loads, the ECU-reported fuel burn is very precise. But, when operating at closer to 25 percent load, rather than the 75 percent or higher load we usually run when coastal cruising, the ECU is just over 13 percent conservative, which is to say our actual range is 13 percent farther than we thought.

It took nearly half the trip to conclude this was occurring and be confident that we were not seeing measurement errors. Each check ended up with a bigger number than expected. Early in the trip, it was only 10 to 20 gallons, so this was lost in the measurement noise.

But, as the trip progressed, the number just kept rising. Eventually we had 160 gallons "too much." At that point, the data was inarguable and we adjusted our speed to run much faster and enjoy the couple of hundred gallons of newly "discovered" fuel. This is one of the reasons the second half of the voyage was so much faster than the first half. This is great news because it means our maximum range is actually well in excess of 3,500 miles and, even better, we can run faster than we have been on longer passages. It's like we just added more than 300 gallons of fuel tank capacity to *Dirona*.



Below: Jennifer taking the night time shift at the helm; Above/right: Engine guages illustrating the critical details of our trip crossing the Indian Ocean. Far right: Dirona's *path for the 3,000-plus mile crossing.*

James Hamilton

ADDED LESSONS

We have always operated *Dirona* by driving to the required fuel economy rather than the more common practice of setting a specific rpm for the trip. The reason we prefer to drive to fuel economy is that this really is the limiting factor on longer trips. We have found that current, winds, and swell can have a tremendous impact on fuel consumption.

When we first got *Dirona*, like many new owners, we carefully measured our fuel economy on flat water and were amazed at how good it was. Then we went out in the open ocean and were amazed at how much different the results were. Swell can take 3/4 of a knot off the top and at times it can be as much as a full knot slower. This is important because the fuel burn stays the same, the rpm stays the same, but the distance traveled can be reduced by upward of 15 percent. The effective loss of distance could yield some unfortunate surprises when crossing an ocean.

The negative impact of swell isn't that surprising but what has been an eye opener for us is the power and speed of currents in the open ocean. It seems strange that 1,000 miles from shore it's possible to find current running a full knot or more, but it certainly does happen.

What is perhaps even more surprising is how much it can change over very short distances. The overall ocean current predictions probably are reasonably accurate on average but the hour-to-hour changes are not predicted and there have been trips during which we have seen currents for days at a time that were running opposite to the predictions. I've jokingly concluded that ocean current predictions are only there to make weather prediction look comparatively accurate.

THE SUMMARY DATA FROM THIS TRIP:

Fuel consumed:
2,365.6 gallons
Fuel left on arrival:
221 gallons
Total actual distance:
3,023.2 miles
Overall fuel economy:
1.28 miles/gallon
Overall speed:
6.6 knots
Total trip hours:
461.3 hours (19 days, 5.3 hours)
Gallons per hour: 5.13
Average RPM: 1,681

DRIVE THE LIGHTS

Because actual fuel economy can vary so greatly due to the force of winds, currents, and swell, you really only have two choices: You can allocate a very large reserve to account for the fact that consumption can vary by 15 to 20 percent in adverse conditions, or you will need to periodically check on the fuel load and remaining distance, and adjust your speed accordingly. The latter allows the boat to run faster and it seems the safer approach as well, so we run to the trip-required fuel economy.

Now that we have accurate fuel-tank level data, I have written software that tracks distance and fuel remaining on each trip and it keeps an up-to-date fuel economy goal. The program uses this data to compute the needed fuel economy, the rate of consumption, and it shows two green lights when operating at the correct speed. If conditions change and we end up getting better economy than predicted, one light is switched from green to orange to indicate that more speed will still allow the destination to be reached with the intended reserves. If conditions worsen and the fuel economy falls below the goal, then the left light changes from green to red to indicate that the boat needs to be slowed to improve economy. We essentially just "drive the lights" and verify the computations and electronic fuel level indications using the sight gauges on each engine room check.

Nothing is more relaxing when aiming to finish a run with 200 gallons remaining and arriving with exactly the amount expected fuel in reserve. It's nice to see the systems operating as expected. ■

James and Jennifer Hamilton have cruised powerboats since 1999, Beginning in the Pacific Northwest. Along the way, they wrote numerous magazine articles and the Waggoner Cruising Guide Companion: Cruising the Secret Coast. *In 2010 they bought* Dirona, *a Nordhavn 52, and have since racked up more than 6,400 main engine hours over 44,000 miles.*

Trips have ranged as far north as Prince William Sound, as far inland as Idaho, and as far south as Tasmania. They have explored Hawaii, the South Pacific, New Zealand, and Australia. Currently they are in Reunion destined for South Africa. You can find their regular blog posts online at www.mvdirona.com