SOL performance loss

- The performance loss from changing tack is half the boatspeed after the manoeuvre in percentages

- The performance loss from normal turns is shown in the graph below

- Any manoeuvre executed with a performance lower than 93% will not result in an extra loss

- The performance recovery is slower if the boatspeed is higher. The graph “Time to 100%” shows how long it will take with a given boatspeed, to reach 100% performance. The graph “Distance lost after a given performance loss” shows what how much distance was lost while the performance is recovering.

How to use the graphs

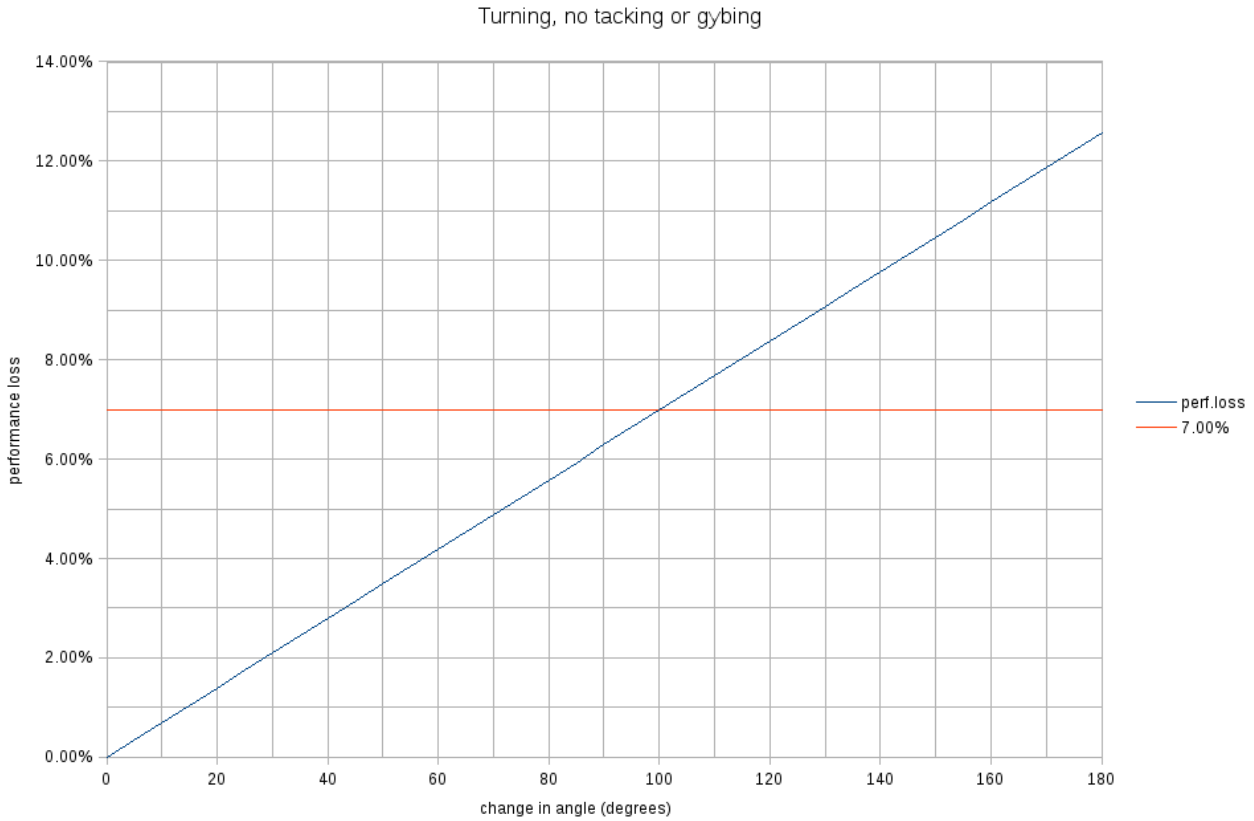
To find out how much distance is lost after a manoeuvre, first find what the performance loss will be. For a tack changing manoeuvre, divide the boatspeed after the manouvre by two, for other manoeuvres use the graph below.

Subtract this performance loss from your current performance.

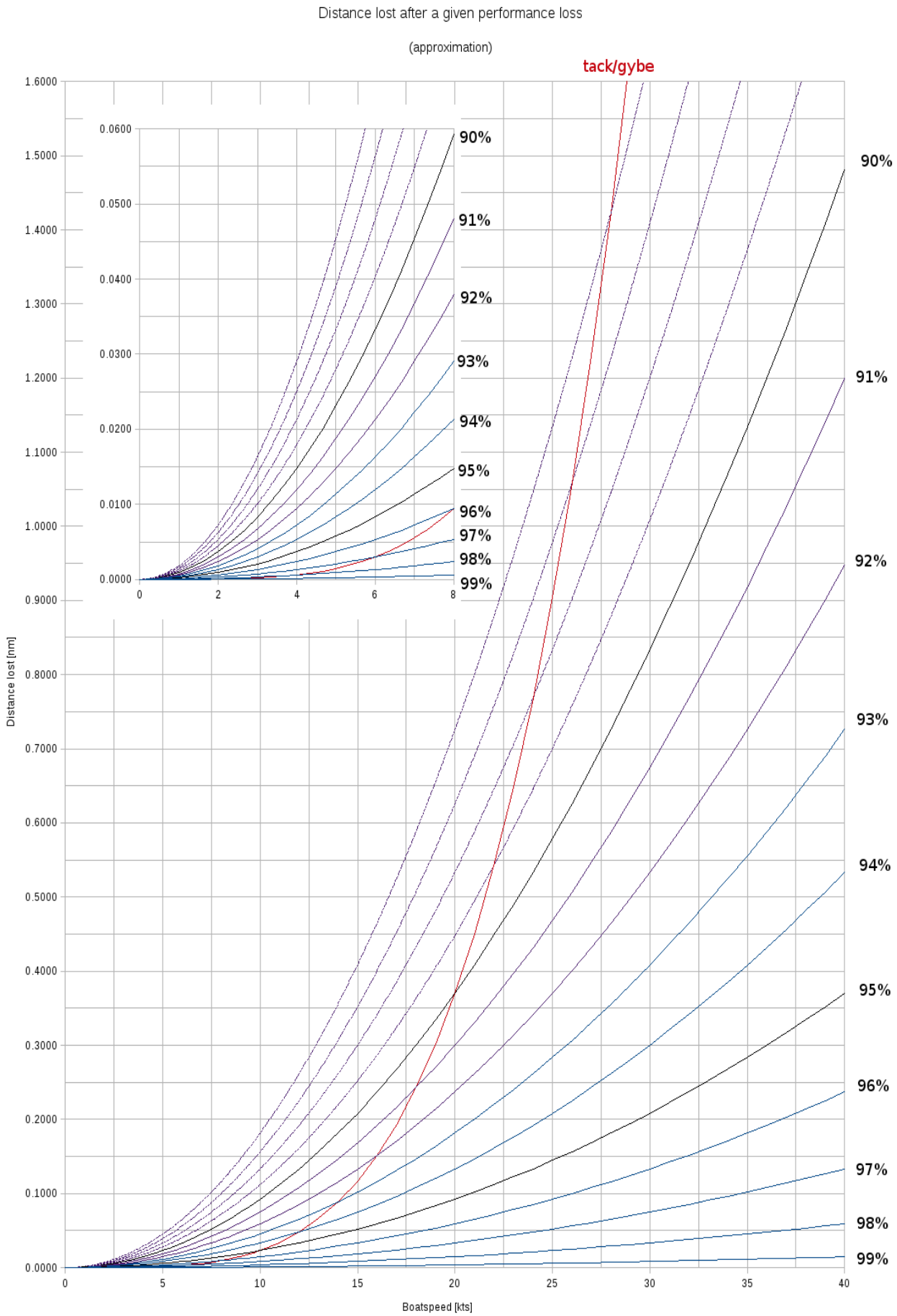
Find a line in the “Distance lost” graph that indicates a performance close to your newly calculated performance. Use the boatspeed after the manoeuvre to find how much distance was lost.

To find how long it will take to reach 100% performance, find you boatspeed (after the manoeuvre) on the x-axis and performance on the y-axis, the the closest line will indicate how long it will take you to reach 100%

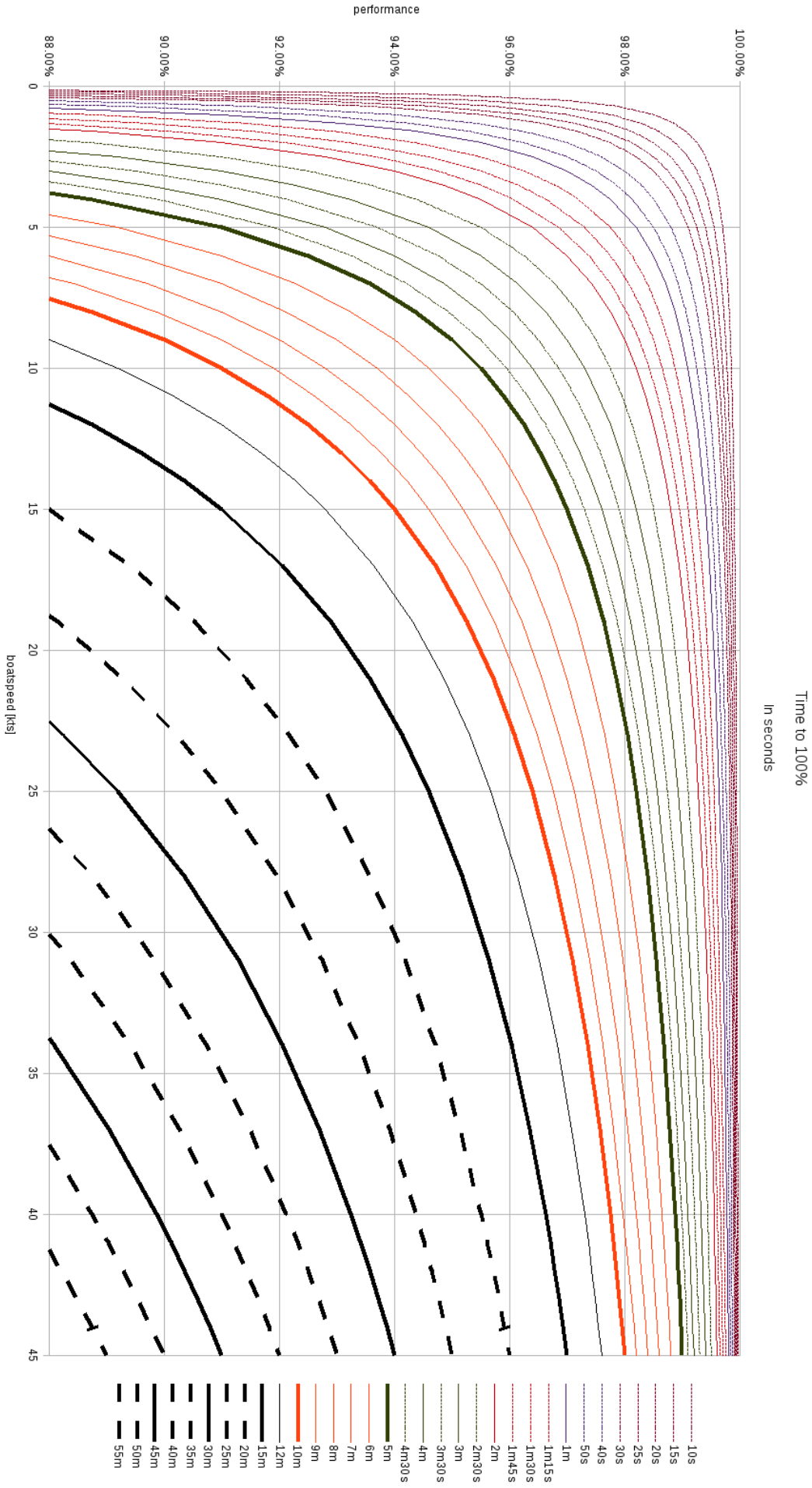
To find the distance lost after a tack or gybe (starting at 100%), use only the red line in the “distance lost” graph. Find the boatspeed after the manoeuvre on the x-axis, and the hight of the red line will indicate the lost distance.



Questions? Ask kroppyer (info@kroppyer.nl)



Questions? Ask kroppyer (info@kroppyer.nl)



Inaccuracies

The performance loss can be calculated very accurately, but the recovery is in these graphs approximated. The recovery depends on your boatspeed. If the boatspeed was constance, the recovery would be linear. In the graphs and approximated formulas (below) it is assumed that the recovery is linear. In (virtual) reality however, the boatspeed increases slightly as the performance increases (that's how performance works). If, for the recovery, you read of the values at your boatspeed after the manoeuvre including and excluding performance hit, then the actual value will lie inbetween.

Actual performance model

Performance recovery

```
new_perf = min(100, old_perf + delta_time*3/(20*abs(boatspeed)))
```

> `new_perf` and `old_perf` in %
> `boatspeed` is actual boatspeed (not boatspeed when perf would be 100%) from previous "server jump" in knots
> `delta_time`: time since previous "server jump", in seconds
> `abs(x)` makes `x` positive
> `min(x, y)` returns the smallest value of `x` and `y`.
This formula basically translates to
"Your performance will increase with `[9/boatspeed]`% per minute, until you reach 100%"

Performance loss

```
if(tack or gybe and old_perf >= 93)
      new_perf = old_perf * (1 - abs(boatspeed)/200)
else if(normal course change and old_perf >= 93)
      new_perf = old_perf * (1 - dTWA/25)
end if
```

> `new_perf` and old_perf in %
> `boatspeed` in knots
> `dTWA` is the positive difference between TWA before and after the course change, in radians (1 radian = 180/pi degrees)

Useful (approximated) formulas

Distance lost after tack or gybe $\frac{boatspeed^4}{432000}$

Distance lost after normal turn $\frac{(dTWA \times boatspeed \times \pi)^2}{218700000}$ (dTWA in degrees)

Distance lost after given performance loss $\frac{(boatspeed \times performance\,loss)^2}{10.8}$ (performance loss as normal number (e.g. 0.03 instead of 3%)

Time to 100% $\frac{performance\,loss \times boatspeed}{5.4}$ (perf. loss as normal number (e.g. 0.03 for 3%)