Islander 36 clinic

April 12, 2014

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HEAVY BOATS

LIGHT BOATS

Righting Moment

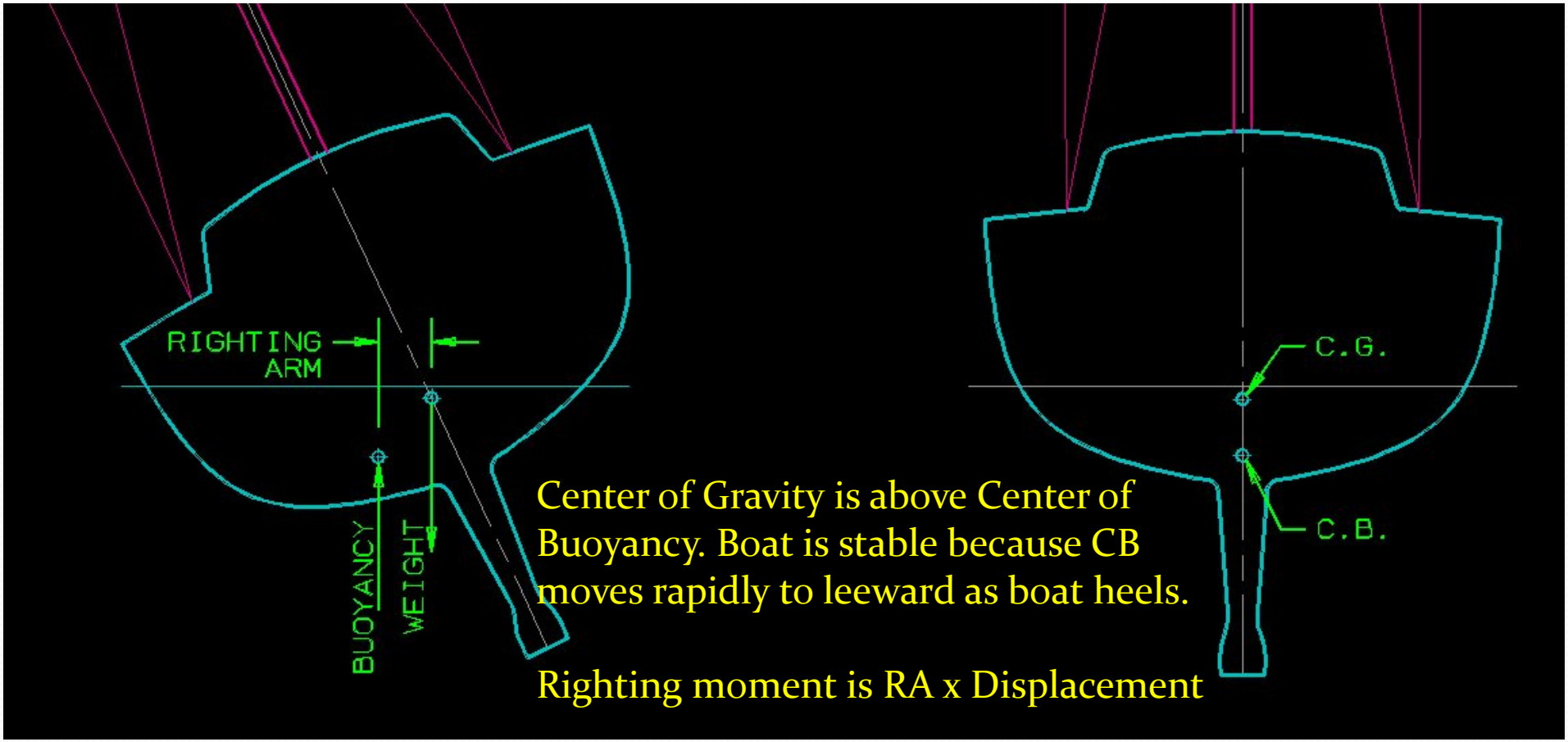
HEAVY BOATS

Longer waterline
More momentum
Greater righting moment
(increased waterplane & more weight)

Generally faster upwind and power reaching
moderate to heavy winds

LIGHT BOATS

Less drag
Generally faster upwind in light air
And downwind always

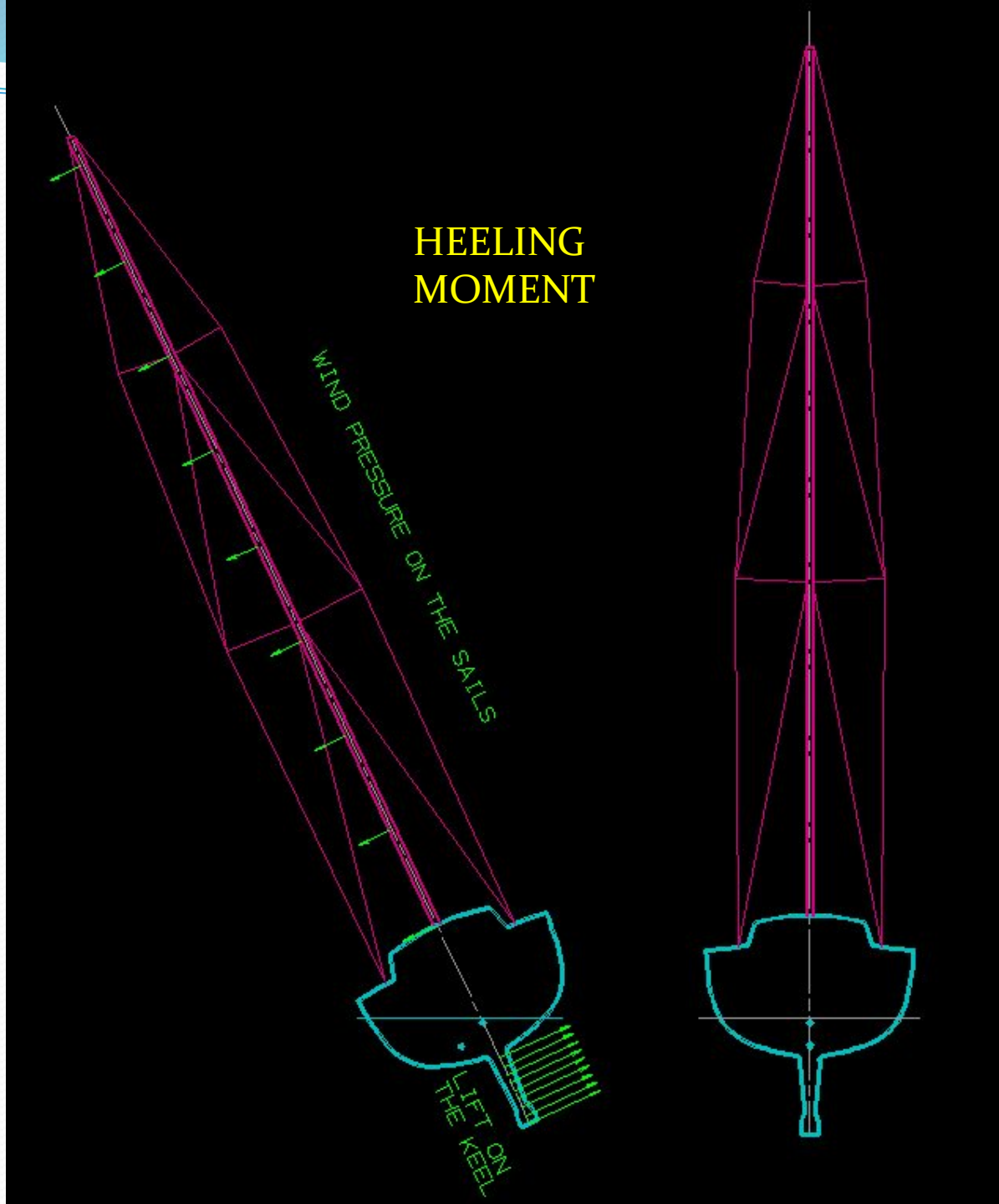


Center of Gravity is above Center of Buoyancy. Boat is stable because CB moves rapidly to leeward as boat heels.

Righting moment is RA x Displacement

RIGHTING MOMENT
RESISTS
HEELING MOMENT.

More RM from higher displacement or crew on the rail means more power in high winds, better sail carrying ability.



LEAD KEEL HAS LOWER C.G., MORE R.M.

Weight Distribution

Almost everything has a natural rhythm, a resonant frequency.

(Notice how different areas of your deck, gear, or rigging vibrate as engine RPM changes?)

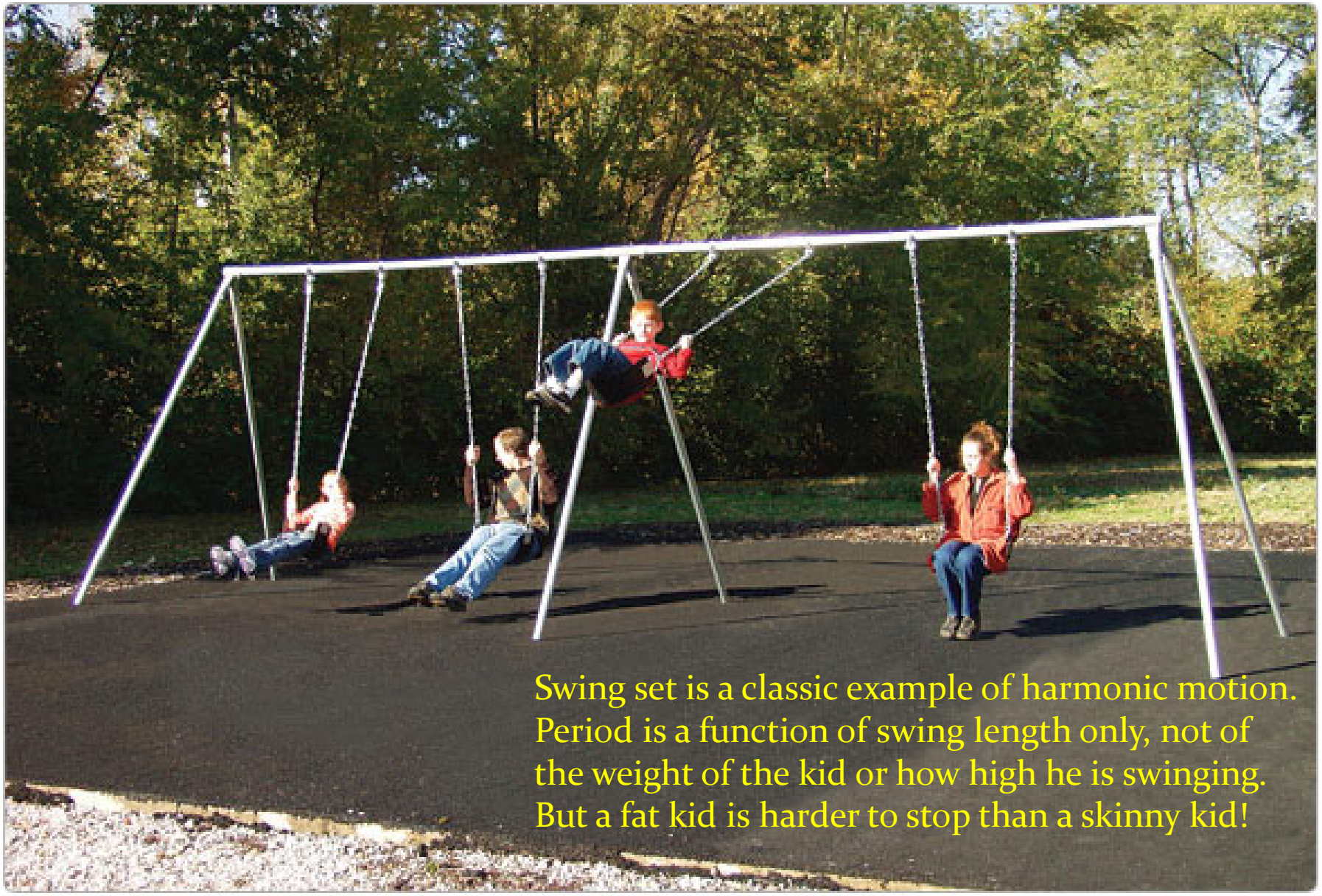
T = period in seconds

L = pendulum length

or radius of gyration of a boat

$$T = 2 * pi * (L / g)^{.5}$$

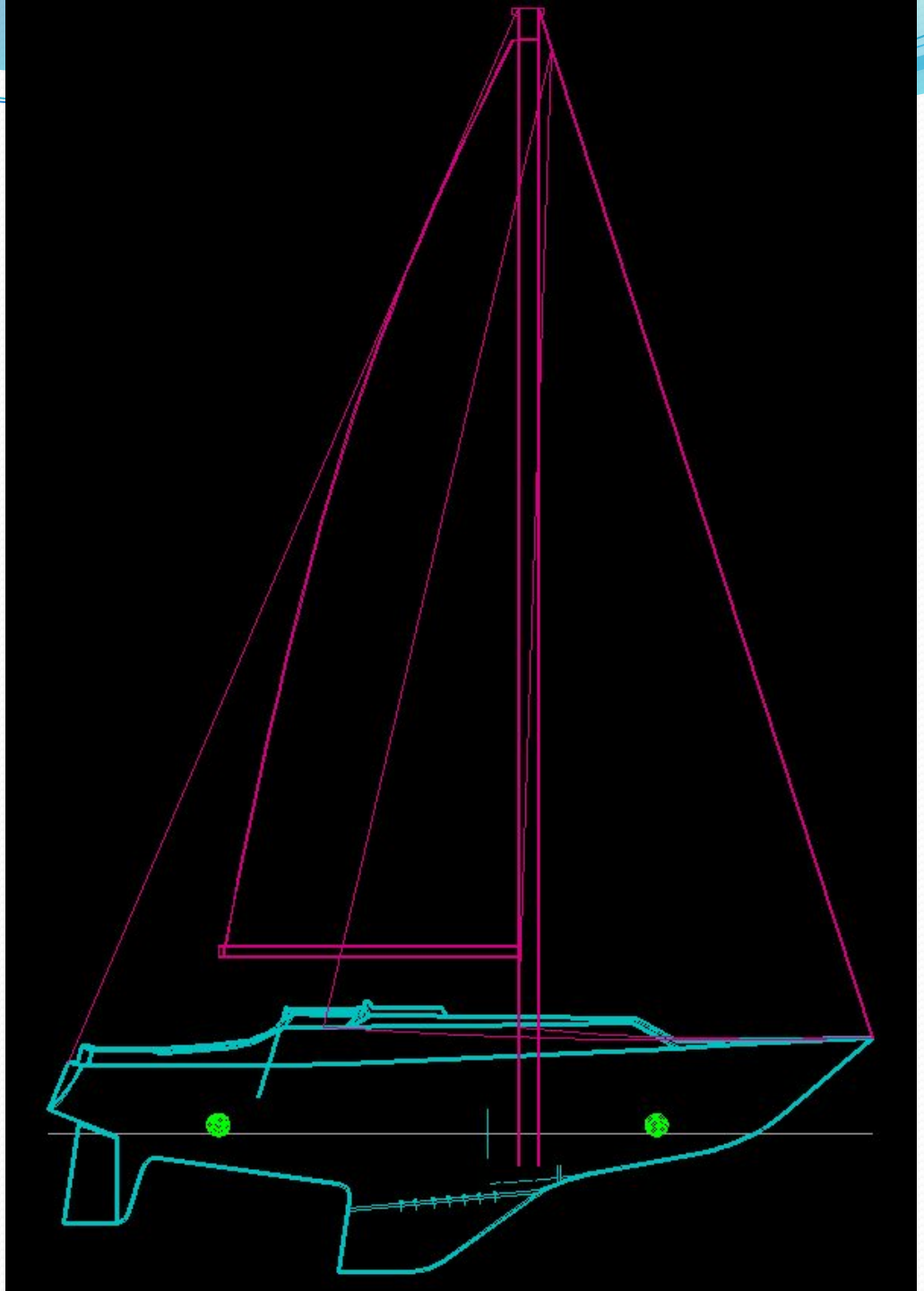
(Note that L is the only variable.)

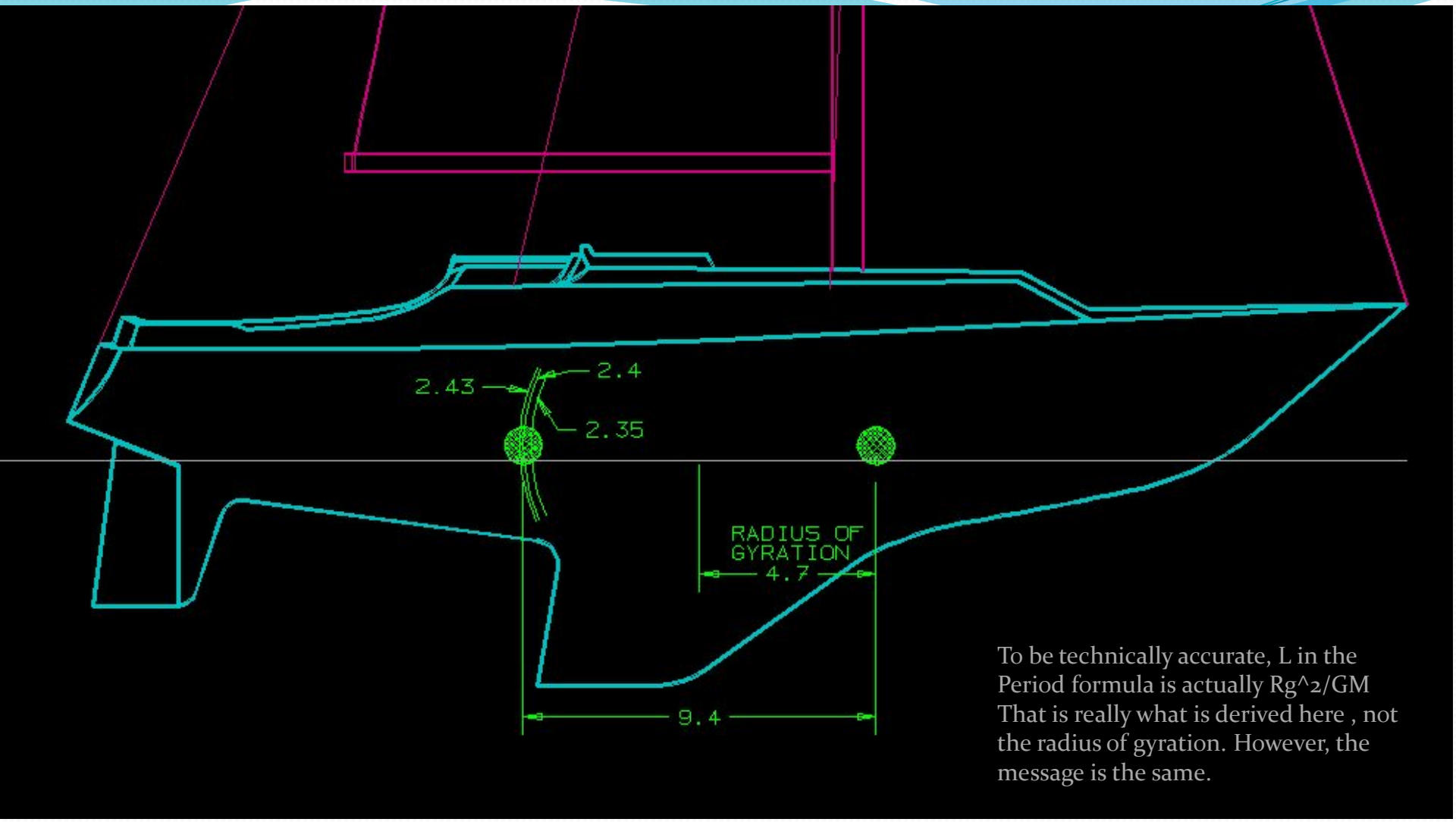

Swing set is a classic example of harmonic motion.
Period is a function of swing length only, not of the weight of the kid or how high he is swinging.
But a fat kid is harder to stop than a skinny kid!

IMAGINE ALL WEIGHT IN THE BOAT AVERAGED INTO TWO WEIGHTS SEPARATED BY A DISTANCE.

THE RADIUS OF GYRATION IS SIMILAR TO THE LENGTH OF A SWING OR PENDULUM.

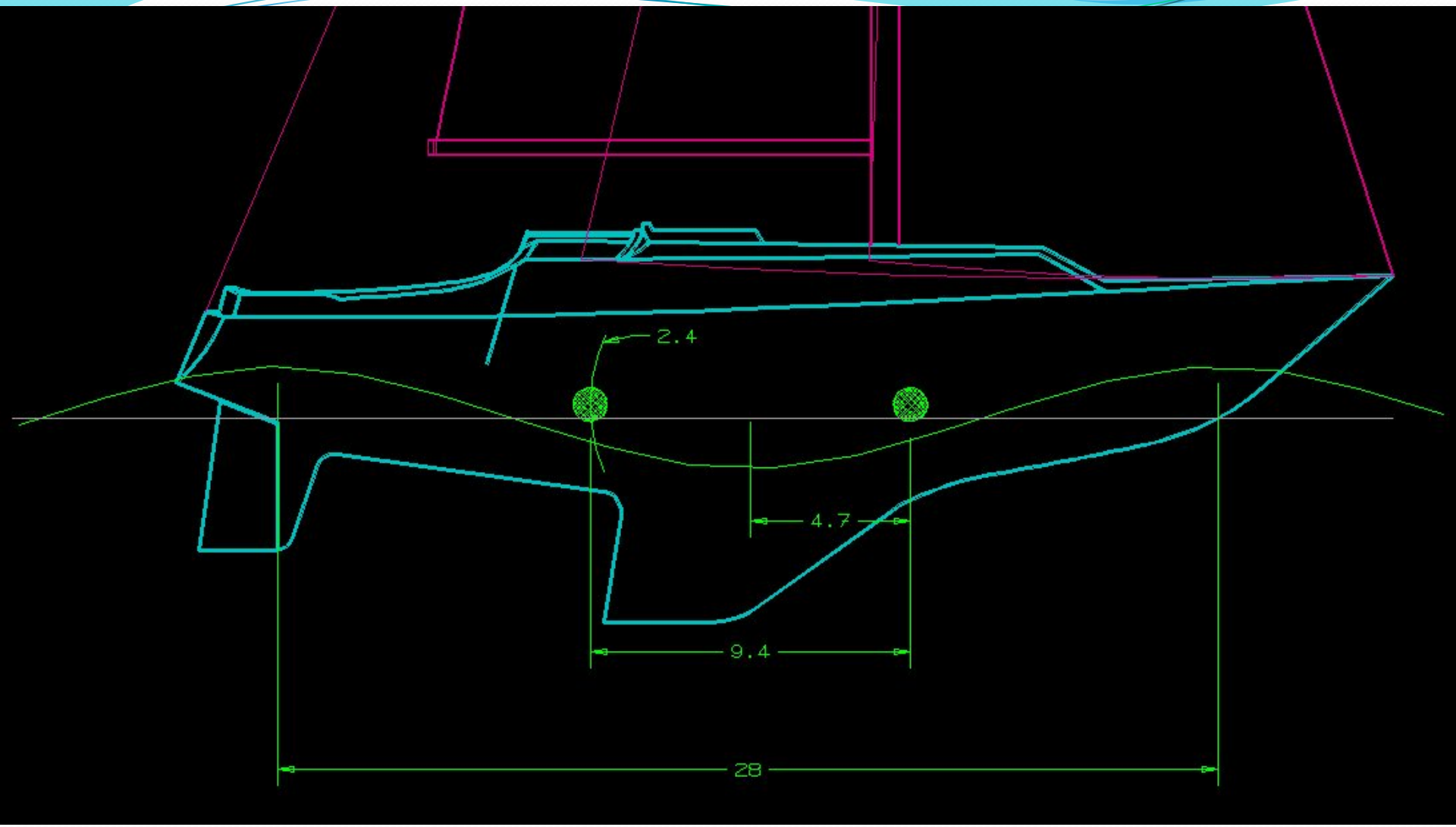
THE RADIUS OF GYRATION IS HALF THE DISTACE BETWEEN THE TWO IMAGINARY WEIGHTS





To be technically accurate, L in the Period formula is actually Rg^2/GM That is really what is derived here , not the radius of gyration. However, the message is the same.

Pitch period of 3 Islander 36s measured at 2.35, 2.40, 2.43 seconds.
Arc shows relative Radius of Gyration derived for the 3 boats,
Radius of Gyration = 4.7 feet for 2.4 second period
Shorter period better in most waves – get the weight out of the ends!



Boats generally pitch most when wave length is close to boat length.
Wave period matches boat's natural pitching period. Worst case probably when wave period is twice boat period, so bow if rising when stern is falling.

28’ wave travels at 7.1 knots. Wave period is 2.4 sec

Radius of gyration of Islander 36 is about 9.4’/2 = 4.7 feet
Resonant frequency = 2.4 sec so boat will pitch dramatically at anchor when wave length matches waterline.

A boat going upwind may be slowed by big waves, and if slowed until wave period is close to the boat’s natural pitching period: hobby horse city!

A lighter boat, or a boat with less weight in the ends will pitch less vigorously and will be faster.

Happy cruisers: crew weight is concentrated aft in the cockpit and is not on the rail (but maximizing speed is not a concern here).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Observations- Previous slide

They look really happy! Having Fun!

Crew could be hiking more aggressively.

Sails look terrible

Bottom looks good

Helm seems balanced

Headstay sag? or just not unfurled jib

Anchor on bow

Aft lower spring??

Bottom's up

Just because you aren't looking at it doesn't mean your bottom is unimportant.

Keel and rudder foils just as important as sail shape, and are in use 100% of the time!

SPEED AS A FUNCTION OF SAILING CONDITION:

Optimum Beat				
VTW	BTW	V	VMG	Heel
6	46	4.152	2.859	4
8	45	5.092	3.572	8
10	44	5.777	4.127	15
12	42	6.032	4.468	19
14	41	6.175	4.687	21
16	40	6.272	4.829	23
20	39	6.388	4.971	27

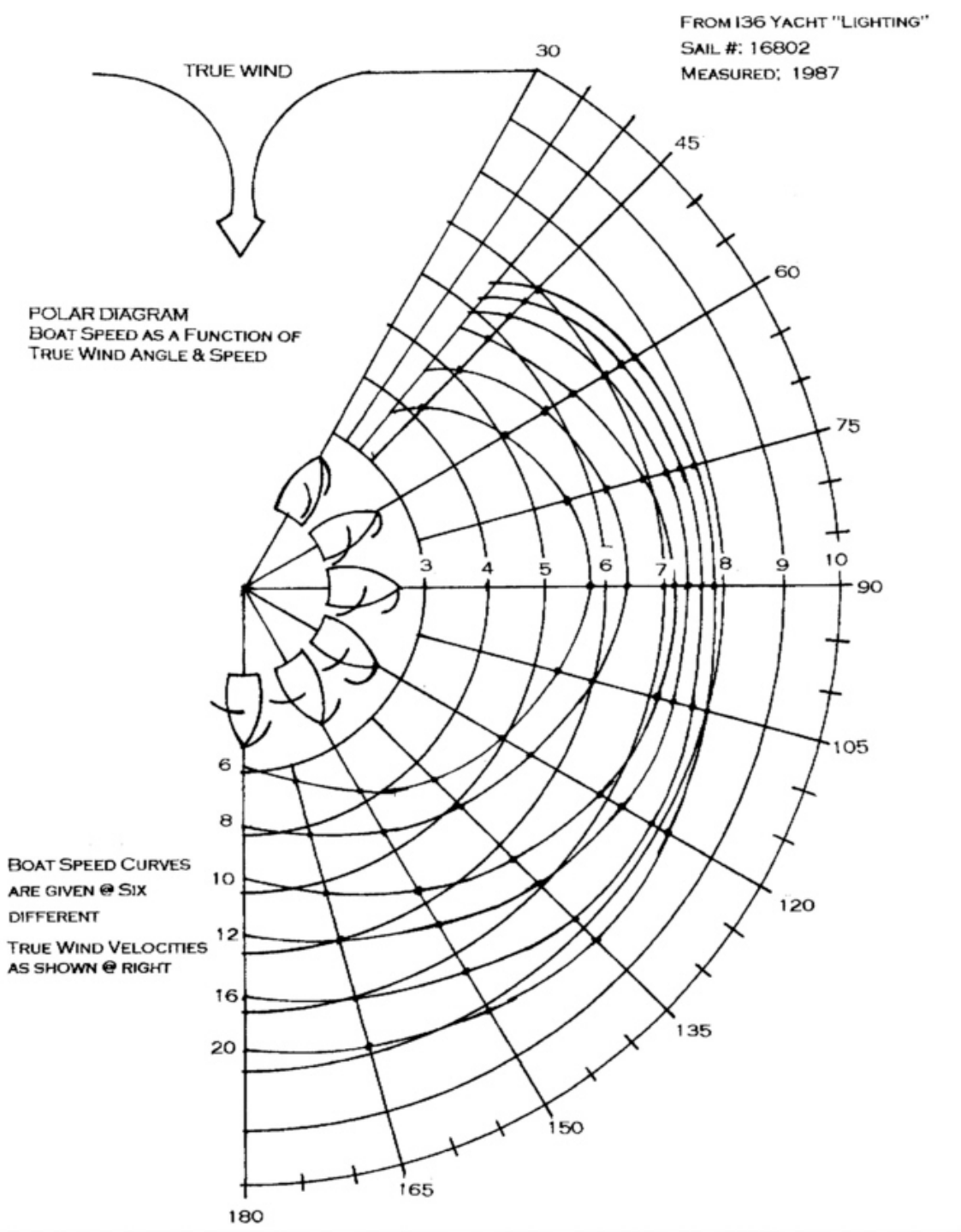
Optimum Run		
BTW	V	VMG
142	4.032	3.181
145	4.965	4.067
149	5.675	4.888
163	5.932	5.668
169	6.39	6.281
173	6.79	6.737
175	7.473	7.44

Reach BTW=45	
VTW	V
6	4.043
8	5.052
10	5.829
12	6.246
14	6.473
16	6.624
20	6.773

Reach BTW=90	
V	Heel
5.646	5
6.558	10
7.01	16
7.31	22
7.515	27
7.653	30
7.875	20

Reach BTW=135	
V	Heel
4.403	1
5.573	2
6.411	3
6.905	3
7.295	4
7.637	6
8.239	10

Reach BTW=180
V
2.915
3.827
4.694
5.512
6.215
6.703
7.417


FROM I36 YACHT "LIGHTING"
SAIL #: 16802
MEASURED: 1987
TRUE WIND
POLAR DIAGRAM
BOAT SPEED AS A FUNCTION OF
TRUE WIND ANGLE & SPEED
BOAT SPEED CURVES
ARE GIVEN @ SIX
DIFFERENT
TRUE WIND VELOCITIES
AS SHOWN @ RIGHT
30
45
60
75
90
105
120
135
150
165
180
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